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OCTOBER 1991

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MacUser

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printer, from
under \$1,000

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the ultimate
archiving machine

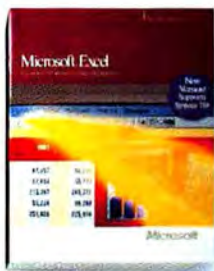
BUDGET SPREADSHEETS:
5 number crunchers
that won't crunch
your wallet

DIGITAL AUDIO:
Turn your Mac
into a recording
studio



	A	B	C	D
1	APERTURE Pro Forma Income Statement			
3	Revenue			1991
4	Asia			175,714
5	Australia			87,857
6	Canada			37,653
7	Europe			213,367

Introducing Micros



Betsy Mill put it all in perspective when she wrote to us, "I love [Microsoft] Excel as much as my microwave oven but no love is perfect."

Well, Betsy, get a load of this. We think new Microsoft® Excel version 3.0 is the closest thing to perfection ever seen in a spreadsheet for the Mac®. For one good reason.

Power made easy.

The new Toolbar™, for instance, reduces common, time-consuming tasks down to one step.

Highlight a row or column of numbers, hit the Σ button (that's Autosum™),

and *voilà* – it all adds up.

Do quick, push-button formatting. Use outlining features to collapse or expand worksheets without having to create multiple files.

As for charting, we took our cue from Paul Woods of St. Paul, Minnesota, who began his letter with the salutation, "Charts, charts, charts!" Hey, Paul – check out the picture for the full scoop.

Did we mention that you can consolidate up to 255 worksheets at a time, regardless of format?

Or the feature called Goal Seek? Put in the total you want, and Microsoft Excel works backwards from there to fill in the variable you need.

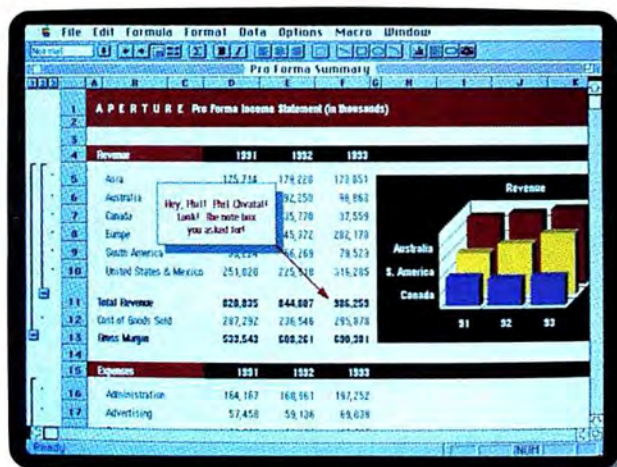
ions Macro Window

na Summary

(in thousands)

1992	1993	1994	Total
179,228	173,851	208,621	737,414
92,250	96,863	101,706	378,676
35,770	37,559	39,437	150,419
245,372	282,178	324,505	1,065,422

Microsoft Excel version 3.0.



Yes, Paul, you can incorporate any of 68 chart types (24 of which are 3-D) right into your worksheet, along with text and data. And notice the outlining feature on the left? Go nuts.

Or the fact that this is the first System 7.0 application available?
We did fall short in one area, how-

ever, with Ralph Levy's cat. Here in Redmond, we're not very well-versed in how to remove cranky, sharp-clawed felines from atop user manuals.

Let the cat have your old manual, Ralph. You'll get a new one when you update your version of Microsoft Excel for \$129 (or \$50 if you acquired it on or after 12/7/90). Call (800) 541-1261, Dept. Q80, to find out more.

And by the way, Bryan Larson of Mission Viejo, California: we said hi to Bill for you. He sends his regards.

Microsoft
Making it all make sense

We'd like
to respond
to your
suggestions
on how to
improve
Microsoft
Excel.

Will work on what on your mind and it could end up on your screen.

"Collapsing Cells" : Collapsing cells would be to a spreadsheet what outlining is to a word processor.

A "collapse" command will allow a number of worksheet cells to essentially disappear and become part of a "header" cell. This would allow ~~the data~~ the data which underlies a displayed number to be kept with that number, but not necessarily shown.

For example, this would collapse a

The collapsed cells would still exist, but would not be displayed or printed unless an "Expand" command were used. It is possible that a "toggle" option might be used, so that the user would be able to have this be an automatic feature.

Sincerely, John Brubaker, jbrubaker@msn.com

Microsoft

Tell us what's on your mind and it could end up on your screen.

System 7.0 support

Sincerely,
Allen Rife

Microsoft
Making it all easier together

©1991 Microsoft. One of the ways Microsoft fulfills its vision of "to empower the individual" is to make your investment in our products back.

What are we doing?

Tell us what's on your mind and it could end up on your screen.

Integrate a style sheet feature such as that used in MS Word sometimes, more often than not, I like a format that has been set up ahead of time. I would like to copy it back, store it and then use it as a new document without recreating the cell style aesthetic in spreadsheet.

Thanks for your ongoing efforts!!

Virginia Fisher
Duluth, GA
Microsoft
Member of the community

Search Microsoft for the Microsoft Store and the Microsoft Store. Microsoft Store is the place to go for the latest software and services from Microsoft.

Tell us what's on your mind and it could end up on our screen.

How about being able to add notes on to the spreadsheet that have no effect on the cells? Example?

	A	B	C	D	E	F	G	H	I	JOP
1		1	2	3						
2		5	6	7						
3		7	8	9						
4										

Note, this is the magic number in this group of numbers!

Thx Phil Chavatal

Source: Source & Data by Microsoft Excel 2010 File -> Home -> Styles -> Conditional Formatting -> New Rule... The Number Of... Selected... Microsoft Support Help Center Search Bar
Microsoft Making it all make sense

Tell us what's on your mind and it could end up on your screen.

3D CHARTS

Microsoft
Managing all your money

Microsoft® Excel for National Development Teams that help you manage your money. Microsoft® Money 2004 and download and install money.com money.com

[illegible]

To do so, think on your mind and it could end up on your screen.
 Provide capability for What-If Analysis, so that once the dependent variables formulae are entered, it
 can do the rest of the independent variables that will help achieve that result. The current method is
 the trial-and-error, which rarely exact and very inefficient.
 Provide capability to integrate text, a portion of the spreadsheet and the graph in integrated text
 and capable to automatically prepare a presentation ready copy.
 In looks forward to seeing these capabilities in Microsoft Excel soon.
 Sincerely,
 Raymond Seltman
 Chicago
Send in the Mail: Send in National Computer News Item Mail to National Bus. Methods, Marketing 990-0000 but don't include your name address or e-mailing a mail

Tell us what's on your mind and it could end up on your screen.

BETTER CHARTING FEATURES.
3D CHARTS
DRAWING TOOLS?
THANKS
DON GAUTHIER

Find out Microsoft Excel 4 Microsoft Dynamics ViewBook 10/10 The Microsoft Way, Redmond, Washington 98073-0801. Just give us your e-mail address to see this book.

Microsoft
Making it all make sense.

MacUser

OCTOBER 1991

Volume 7 Number 10

Cover photo by Steven Underwood

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Color printers
you can afford.



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new
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journey.



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incredible.



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Shoot-out
at the font
corral.

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Catch a Wave: Digital Audio

BY PAUL D. LEHRMAN AND TIM TULLY

Lights! Camera! Music! If you have a Mac, you have the heart of a recording studio on your desk, ready for spicing up your presentations or cutting your next demo tape. Here's everything you need to get started. **94**

Sensible Spreadsheets

BY SHARON ZARDETTO AKER

You don't need a spreadsheet to tell you that these five low-cost spreadsheet programs — BiPlane, DeskCalc, Full Impact, MacCalc, and Microsoft Works — are just the thing for budget-conscious number crunchers. **106**



Less Is More: Digital Audiotape

BY STEPHEN SATCHELL, H. B. J. CLIFFORD,
AND THE MACUSER LABS STAFF

One tiny DAT cartridge holds as much as a dozen hard disks or a thousand floppies do. For storing, backing up, archiving, or transporting your data, nothing holds more data for less money. We tested 19 DAT drives to find the best. **116**



The Affordable Rainbow: Color Inkjet Printers

BY PAUL YI AND THE MACUSER LABS STAFF

Talking about color printers used to mean deep shades of green — either lots of money or lots of envy. But with prices of full-color inkjet printers starting at less than \$1,000, you now have a rainbow of affordable options. We tested four budget beauties and sneaked a peek at an incredible color-printer-price breakthrough that's just around the corner. **140**

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“A digital-audiotape — DAT — cartridge is less than half an inch thick, is smaller than a business card, and can hold 1.3 gigabytes of information — room for a double-spaced report stacked taller than the Washington Monument.” 116



Guy knows.



"Dollar for dollar, TouchBASE is the most functional piece of Macintosh software I've ever seen."

Guy Kawasaki, Macintosh Evangelist

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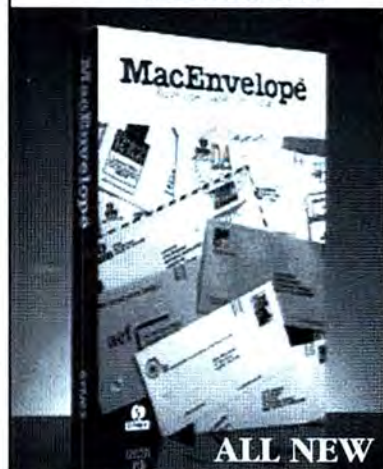
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ZMAC: MacUser On-Line

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Writing for MacUser

If you have an idea for an article you'd like to write, we'd like to hear about it. Send a query letter with samples of your writing (published, if possible) to James S. Bradbury, *MacUser*, at the above address. Allow four to six weeks for a reply.

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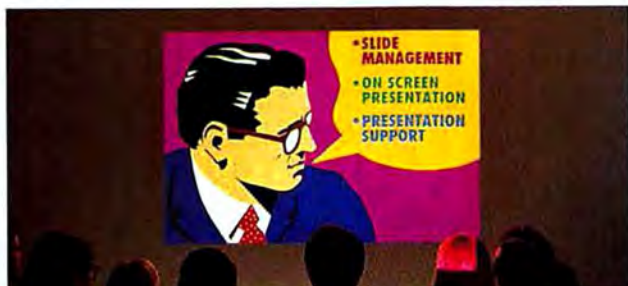
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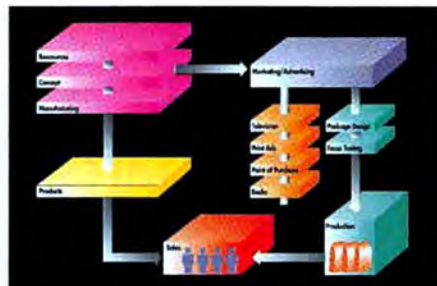
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FileMaker Pro
MacDraw Pro
MacDraw II
HyperCard
MacProject II
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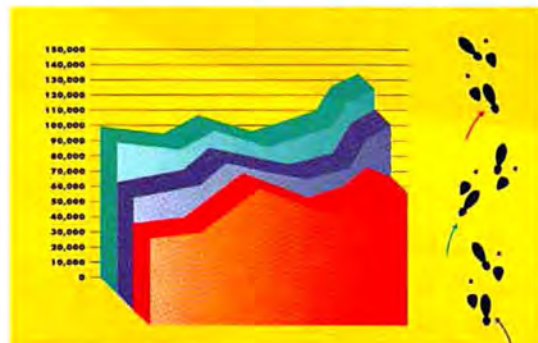
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Disk Specs.

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About

MacUser

Testing 1...2...3...Z-D

The benchmarks and test results you read in each MacUser Labs report are just the tip of the iceberg. Underlying all that data is a complex testing process that must take place before we even begin to run the actual benchmarks. To help in that process, MacUser Labs is about to gain access to an incredibly powerful new resource.

The life cycle of a lab report begins months before any testing can occur. First, MacUser Labs project leaders and technicians scour the known product universe, leaving no stone unturned, to guarantee that we include all eligible products in a lab report on a particular product category.


A project team then analyzes the factors that are most critical to buyers of that type of hardware or software. To make these assessments, the project team must become intimately familiar with the state of the technology in that product category.

The next stage in the life cycle of a MacUser Labs report is critical: figuring out how to objectively evaluate and analyze product performance. The benchmarks must be designed to be unbiased, repeatable, accurate, and representative of the broad range of real-life applications and system configurations important to our readers.

The complexity of the testing process is further complicated by interoperability considerations that extend beyond the boundaries of the Macintosh platform. That's why we designed and built a facility in our labs called the NetWorkShop. Soon, however, we'll have access to another, even bigger, even better resource: Z-D Labs (Z-D stands for Ziff-Davis Publishing Co., our parent organization).

Located a football's throw or so (if you're Joe Montana) from MacUser's offices in Foster City, California, Z-D Labs is being set up as a centralized, exclusive test facility for the seven Ziff-Davis magazines published in the U.S.: MacUser, PC Magazine, PC Week, MacWEEK, PC/Computing, Computer Shopper, and PC Sources. It will be headed by Elizabeth Springer, formerly director of end-user computing at Equifax, in Atlanta.

As of this writing, Z-D Labs consists of little more than blueprints and several thousand square feet of empty space. But by the time this issue of MacUser hits your mailbox or newsstand, Z-D labs will have emerged as an invaluable resource helping MacUser and our sister publications develop benchmarks that are relevant and consistent across all computing platforms.

A key player in that task will be Z-D Labs' new test manager, Andrew Eisner, formerly director of MacUser Labs. At Z-D Labs, Andrew's role will encompass working with Macintosh, PC, and workstation platforms as well as the networking technologies that are increasingly important in real-world product evaluations. Although we'll miss Andrew's day-to-day involvement at MacUser, we're pleased that our loss is your gain. 



Z-D Labs' director Elizabeth Springer and test manager Andrew Eisner.

Nisus 3.06 Feature Comparisons

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Built-in Graphics

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* Requires the purchase of the XS module

Nisus® is the only word processor that can reformat a mainframe file, illustrate a medical procedure, and even help you learn to read, write, and speak a foreign language.

Nisus' built-in word processing language manipulates words like databases manage data, so mainframe file conversions are easy. Nisus lets you communicate the way the Macintosh works—with words, graphics, and sound.

Word Processing. If you want a word processor that is as easy to use as MacWrite II but more powerful than Microsoft Word 4.0, buy Nisus.

All word processors have "find and replace." Nisus lets you find any word you want to change, (even words with a special *font, size, style, or color*)—even in unopened files—and then replace or *index* your changes. You can select noncontiguous words or use the unlimited undo all the way back to when you opened the file.

Graphics. Sometimes, something as simple as a note with an arrow attached is all you need to make your point. You can "Place" any page of a Nisus file containing text and graphics into another Nisus file where it becomes a graphic. Double clicking "Placed Page Graphic" will open the original file for editing. Graphics can be drawn or pasted to three different layers: the text layer, behind the text, and in front of the text.

This is an example of how to draw attention to something in a document.

Nisus lets you rotate text, which is important if you are designing a two-fold three-panel self-mailer. Nisus also prints pages in pamphlet style with correct pagination for assembly.

Built-in Word Processing Language. Nisus has a built-in word processing language which does for word processing what built-in languages do for databases. For example, the language allows you to develop commands to index all proper names, find and correct all double words, periods, and extra spaces, or to index every word in a document except those you specifically want to exclude. You design features just right for you.

Sound Processing in Nisus XS. The way people communicate most often is with the sound of their voice. Now you can do just that with our new module *Nisus XS*. Attach sound to a character, word, sentence, paragraph, or document. You can even attach it to a graphic. Imagine being able to teach the *sound* of a foreign language, hearing the pronunciation of technical terms, or simply attaching sound to text to teach reading.

Nisus XS takes advantage of Balloon Help, the Publish & Subscribe features of System 7, and for interapplication communication Nisus has implemented Apple Events.

Discover why the world writes with Nisus. Find out why *MacUser* gave Nisus **1/2**, *Byte Magazine* gave Nisus its 1990 Award of Merit, *MacUser U.K.* named Nisus "1989 Best Word Processor," Nisus is shipped with every Macintosh in Korea, and *Macworld Australia* has standardized on Nisus. Note also that Nisus is available in Hebrew, Japanese, and Arabic versions. Call and ask for our free brochure, "How Nisus compares with other word processors." And visit us on CompuServe at our new Paragon Forum. We can't promise sound on CompuServe, but once you use Nisus, you'll

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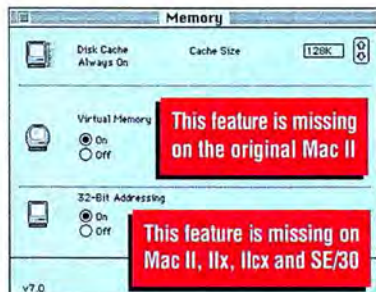
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If you want 32-bit addressing, which is standard on the current generation of machines, you need MODE32.

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If you have an original Macintosh II, virtual memory is also missing from your control panel.

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Get virtual memory with the MC73 PMMU. It is the latest version of Motorola's PMMU and is the only one that is known to be fully compatible with the Macintosh II.

Be sure to get the full power of System 7.0



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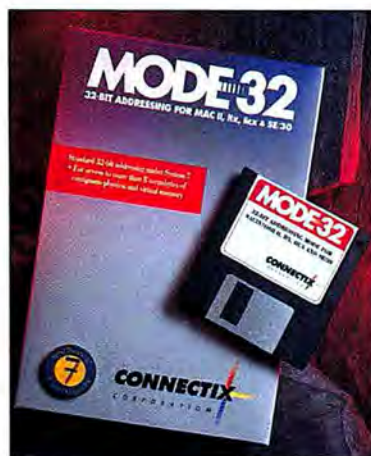
- Open any document, alias or application directly from the Apple menu, and speed through control panels with a single mouse click. HAND-Off II's SuperMenu™ turns the System 7.0 Apple menu into a multi-level hierarchy for launching, opening and browsing folders and files.
- Automatically set the color depth of any application, eliminating extra trips to the Monitors control panel when you switch programs.
- If the program you need is missing, HAND-Off's application substitution can open another automatically. End "Application Not Found" messages.
- Organize files and applications to work the way you do. The pop-up launch menu in HAND-Off II lets you open any file or group of files easily. Open all the spreadsheets, letters, charts and graphics associated with a project with just one click.

Get HAND-Off II, the productivity tool that MacUser rated five mice.

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When John C. Dvorak said Apple was putting on "Rose-Colored Glasses" (July '91, page 292) in comparing Mac performance with that of PCs, many readers rose to defend the Mac. For example, Rob Muir, of Manassas, Virginia, says, "John, John, John. Sure you can buy a PC with more raw performance for less money. But real-life tasks take more than speedy spreadsheet recalcs. Spending a few extra seconds (even minutes) of machine time during a data run is a small price to pay for saving more than 25 percent of my own time for even a moderately complicated task. Raw performance is just that: raw."

✉ Write to Letters to the Editor, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404, or post your letter on the MacUser Forum of Zmac, our on-line service.

All letters become the property of MacUser, and we reserve the right to edit any letters we print. Please include a return address and a daytime phone number.

State Unfair

It is with regret that I sit reading my last copy of *MacUser*. Why am I letting my subscription lapse? My employer, a state agency, authorizes only the purchase of PC clones.

I've used all the tricks and examples from *MacUser* articles for justifying Macs. I've made slides and graphics for fellow staffers who've been hampered by the limitations of their PCs. I've pointed out that although other state agencies have PC-purchasing policies, they make exceptions. Even our governor has a Mac. All to no avail.

Now I'm writing this letter on my new 8-megabyte 386 machine with WordPerfect — the most overrated word processor I've ever used.

Hal Beattie
Winslow, WA

They want you to have a PC clone? Fine. Macs are PC clones. Their drives read and write DOS disks without a hitch, and the SoftPC program from Insignia, of Mountain View, California ([415] 694-7600), lets your Mac run DOS applications. Or if they insist on a 386, the Orange 386 coprocessor from Orange Micro, of Anaheim, California ([714] 779-2772), ought to satisfy them. — LT

WordPerfect

Your review of WordPerfect 2.0 (June '91, page 56) didn't mention that WordPerfect brought one of its better features — automatic file backup with user-specified frequency — from the PC world to the Mac. I've almost lost

files due to power blips and system freezes, but this feature has always saved me. Microsoft Word doesn't offer this capability.

WordPerfect has always provided password file protection. Oddly enough, Microsoft offers password protection for Excel but not for Word. If the Mac wants to be a serious contender in the business world, its applications must have this feature.

WordPerfect has the ability to open documents in popular Mac formats such as MacPaint, MacWrite, and Word from inside the application. These conversions have to be installed by the Librarian command as a preference — otherwise you may miss this feature.

John Clayton
South Charleston, WV

Missing Links

Louis Benjamin's five-mouse review of Excel 3.0 (July '91, page 56) failed to mention a few shortcomings of the program: For one thing, it's slower than previous versions.

Another problem is that the Links dialog box is too small to display file paths and filenames in order to change links.

Excel 3.0 changes line spacing when printing old files. Previous Excel versions could print 48 rows (Geneva default font) on a standard page. Now you can print only 44 rows under System 7 and 46 rows under System 6. This forces you to resize *all* your files so they can print properly.

Some upgrade. Who really cares about the

Dear Mr. Sculley . . .

Have you installed System 7? Did you notice that Apple's TrueType fonts installed themselves in the process? That's one way to create a standard. Adobe's tactic was different: In anticipation of TrueType, it announced a year ago that it would publish the specifications for Type 1 fonts. That worked too. But now we have two font standards, and despite what Apple may have said, they don't always coexist peacefully.

Speak Up: Do we really need two type standards on the Mac?

✉ Send your thoughts to Dear Mr. Sculley, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404.

When we asked readers **how Windows users reacted when they tried the Mac**, it sparked impassioned responses. Bernie Wojcik, of Minneapolis, Minnesota, addressed the question more directly than anyone else: "I can only say that I bought a Mac."

Bill and Lou Falkenstein, of Durango, Colorado, use Macs and PCs, and they think "Windows is pretty much a pain in the neck! All the work we need to do is handled easily with Lotus 1-2-3, WordPerfect, and TaxPreparer. Using Windows is complicated and even ended up jamming the computer several times. We are considering dumping it completely and using only our character-based programs."

Matthew Barczys, of Holland, New York, feels that Apple made a mistake in directing Claris to bring out Windows products. "I know several people who would rather use Windows on a PC but continue to use a Mac for its programs, especially Claris'. By providing an alternative to using Claris' products on the Mac, Apple will lose some of its market." But the most depressing evaluation came from Mark Mathias, of Sherman Oaks, California. He says the problem is that PC users won't try the Mac in the first place. "When I brought my own Mac II into the office to run a scheduling application, not one person came in to look at the system!"

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LETTERS

3-D graphs and the database features?

John O. Holland
Ridgecrest, CA

Although the Links dialog box is smaller, the path fragment you see is just a hint. Click on a path, and then on the Change button, and you get a dialog box that displays the full path.

I don't feel a compelling need for Excel's 3-D charts or its database features, but I do welcome the tool bar, styles, and other features that simplify things for casual users. Power users should benefit from the improved customization options in the macro language and support for IAC under System 7. — LB

Wide Print

I'm a consultant for businesses that want to use their Macs for more than word processing, E-mail, and creating spreadsheets. They have multiuser networks that efficiently handle large amounts of data.

I'm stumped by the lack of a wide-carriage heavy-duty dot-matrix workhorse printer. I don't need a laser printer's quality or expense, but ImageWriter I printers are dying and Apple offers no wide-carriage printer nor do I hear of plans for one. IBM, however, has no problem here.

Didn't Apple want to gain a foothold in the business world? Businesses need to process and analyze information! This market is being left out of Apple's planning, as far as I can tell.

Carol M. Sees
Santo Domingo
Dominican Republic

Try the PrintLink Collection, from GDT Softworks, in Canada ([604] 291-9121). This cable-and-software-driver combination lets Macs work with any of 100 wide-carriage DOS printers. The serial version costs \$99 and the parallel version \$189. — NP

New-Age Retrieval

I appreciate Michael Swaine's writing about Ted Nelson's long-awaited Xanadu (June '91, page 49). But I wonder if he has grasped the concept behind Xanadu and hypertext itself. Today, in what media theorist Jay Bolter has called the Late Age of Print, we are buried under an avalanche of print. The tools that once were adequate for storage and retrieval now seem antiquated and cumbersome.

Xanadu could save us from card catalogs and indexes. Unfortunately, Swaine's example presents the most pedestrian use of Xanadu: being able to consult reviews

before deciding whether to read a new book. Hardly revolutionary stuff. If presumably enlightened souls see Xanadu through print-shingled eyes, it's no wonder it took Nelson 30 years to get funding for the project.

J. Yellowlees Douglas
Windsor, Berkshire
England

Shhh. How're we going to slip this one past the MIS managers if you let the cat out of the bag? The plan is for AutoDesk to release Xanadu on PCs, calling it a "database server." Once the software is in place, the revolution can begin. — MS

Formal Response

When I read Bob and Andy's Help Folder item on the U.S. government's infamous Standard Employment Form 171 (July '91, page 233), I was delighted that Apple is finally bringing power to the (civil) servants.

But it turns out that the Claris SmartForm Assistant 171 template that Bob mentioned isn't available yet, because of continued debate with the federal bureaucracy over reproduction rights.

I'm still hopeful. The ability to easily update and print a 171 form on a Mac may be the greatest boon to Mac sales since the comet of competitive pricing made a close pass last year. Never underestimate the power of long-suffering federal-form filler-outers who'd love to deep-six their Selectric.

Woody Hesselbarth
Grangeville, ID

Claris ([408] 727-8227) should be shipping the 171 template by the time you read this. For those who own MacDraw, MultiSoft Resources ([301] 977-6972) has the forms available now. You have to use your mouse instead of tabbing to move around within the form, but for \$59.95 maybe a little extra wrist action is acceptable. — NP

Free Software

Ouch! I'm not sure which hurts more: getting a so-so review of a product that's no longer on the market or the fact that we couldn't supply MacUser with the greatly improved version 1.5 of our QuickImage 24 video frame grabber in time for it to be included in July's "The Mac/TV Connection: Desktop Video" (page 124).

QuickImage's updated software corrects the image-quality and color-accuracy problems you discussed. It now lets you capture multiple sequential frames,

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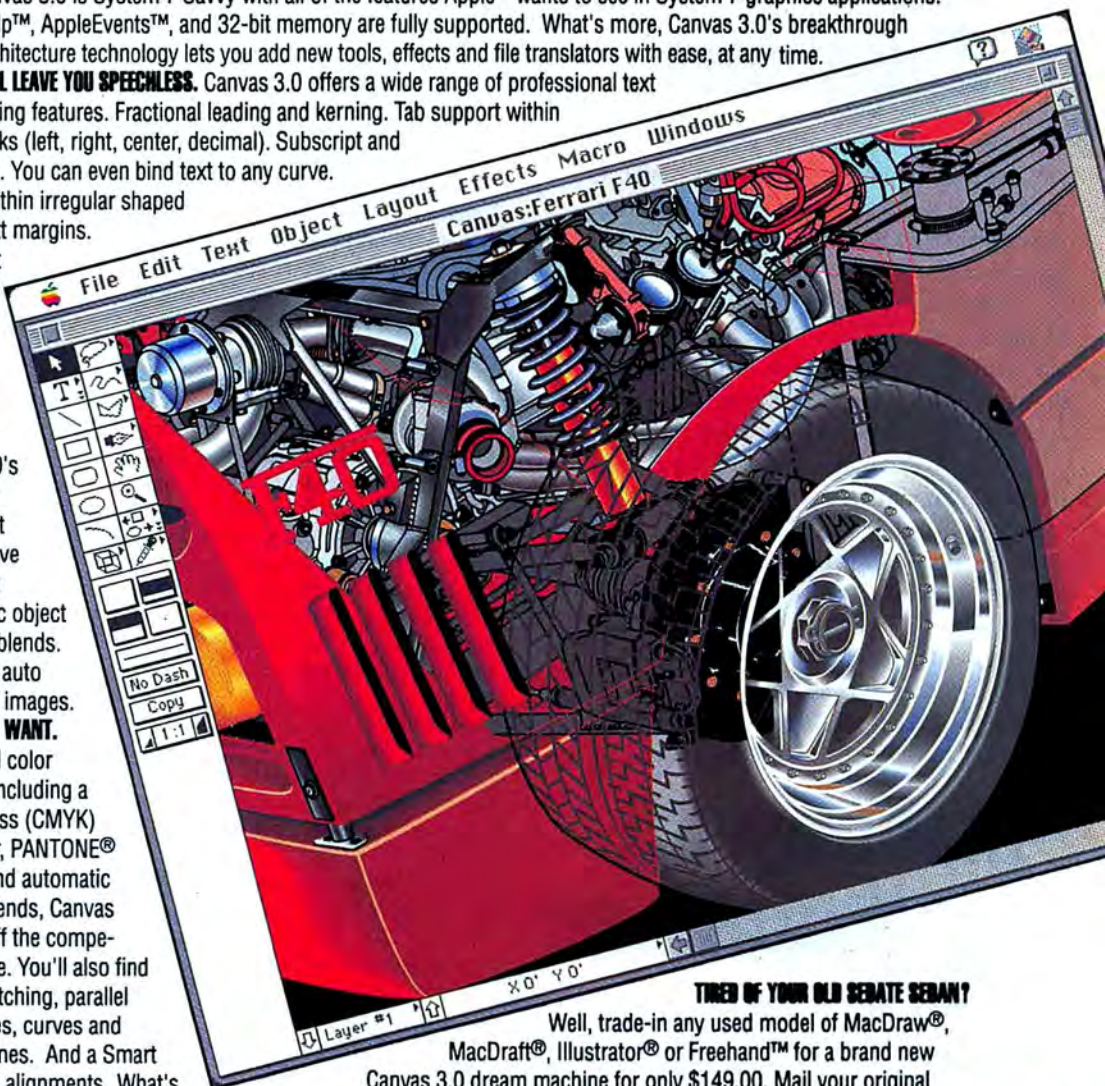
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LETTERS

and we added a Photoshop plug-in.

All registered QuickImage 24 users can get a free upgrade to version 1.5, which includes the new software and a new manual.

Benita Kenn
Marketing Communications Manager
Mass Microsystems, Inc.
Sunnyvale, CA

Hard Choices

Your lab report "Gigadrives: The 1,000-Megabyte Solution" (July '91, page 140) was very timely, especially with the ever-increasing demand for storage-intensive applications. The ultimate goal of the report seems uncertain, however. Are you simply trying to anoint one drive as the fastest or determine the best combination of performance, price, and reliability?

You stated that speed shouldn't be the only criterion for evaluating a drive. But you didn't add that vendors can tweak driver software to speed up a drive — often at the expense of reliability and data integrity. Or they can produce a reliable, superfast drive that simply costs too much.

Instead, you lavished attention on the technically impressive but prohibitively expensive \$10,000 MicroNet SBT-1288NP drive. When running real-world applications, it yields only 5-to-10-percent performance gains over \$5,000 drives.

Most real-world Mac users would agree that reliability and price carry as much weight as performance in their buying decisions. Perhaps you should add some sort of endurance test to measure predicted reliability.

The review also slighted the importance of warranty, support, and service policies. Although a 30-day money-back guarantee is nice, it does little to address problems that can occur during a product's life span. Readers should be informed about the longevity of vendors as well as their experience in the Mac market.

Cliff Wildes
President and CEO
Microtech International
East Haven, CT

We agree that reliability and price carry as much weight as performance — that's why we chose the \$2,699 MacTown DataStor HM1.2/15M as one of our top picks in July. At the same time, we deferred the decision to purchase the speedy but pricey MicroNet SBT-1288NP to "you and your accountant." And, by the way, the SBT-1288NP's real-world

performance gain was nearly 25 percent as measured by MacUser Labs' DiskBasher test — not the 5 to 10 percent you mention.

We disagree with your assertion that a money-back guarantee is simply "nice." Although we applaud Microtech's five-year warranty, we believe that buyers' right to change their mind during the first month is crucial. Only in everyday use can a buyer fully rate performance, software, features, noise, and all the inexpressible subtleties that can't be assessed in a dealer's showroom. — RM

Always a Silverlining

The "Gigadrives: The 1,000-Megabyte Solution" lab report (July '91, page 140) contained some mistakes concerning La Cie's 1000MB ZFP Plus 1-gigabyte drive.

The review reported that the drive comes with Norton Utilities for the Macintosh but that the optimizer isn't included. Not only do we include the Norton optimizer with the bundle but Silverlining, La Cie's Eddy Award-winning software, also has a built-in optimizer as well as many other functions, including quick and easy A/UX partitioning.

The review stated that Silverlining is outdated and doesn't comply with Apple's Inside Macintosh, Volume V specifications. In fact, Silverlining is always kept up-to-date; it was the first third-party Mac hard-drive utility to be Inside Macintosh, Volume V-compliant.

Donald J. Daeges
Technical Support Manager
La Cie Ltd.
Tualatin, OR

You're right. Because incorrect information influenced our evaluation of the 1000MB ZFP Plus 1-gigabyte drive, we have upgraded its mouse rating to four mice. — RM

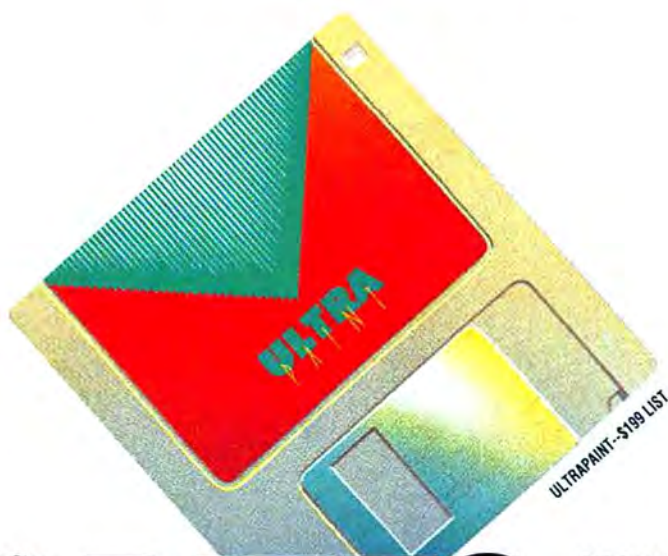
ROM on Holiday

Thank you for a thorough review of our ColorPoint PS printer ("Easy Hard Copy: Color PostScript Printers," May '91, Buyer's Guide page 38) and for spotting a LocalTalk problem. We've traced it to a bug in our AppleTalk ROM that caused the printer to generate intermittent timeouts. The new ROM is now in all ColorPoint printers, which we believe would show improved performance in your tests.

Ron Patton
Product Marketing Manager
Seiko Instruments USA
San Jose, CA

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"...many more B&W paint features than SuperPaint, almost all of PixelPaint's color tools, a superset of MacDraw II's object-oriented features, and the gray-scale prowess of Digital Darkroom. All this comes in a single program for less than half the price...", wrote David Pogue in MacWorld.

Perhaps Chris Prior of MacUser UK summed it up best when he wrote that "UltraPaint...could prove to be the ideal software package for those looking for a powerful, all-around draw and paint program."

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NOTEBOOK SYSTEM

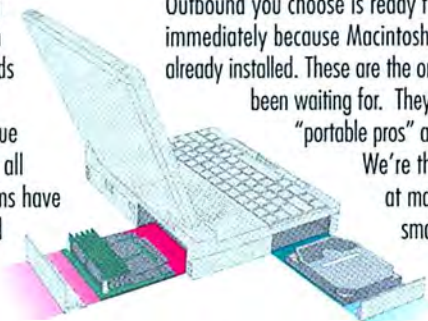
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LETTERS

Color Correction

I always read your Letters section first because of the placement of this section in your fine publication and also to inject a little humor into my day. In the "What color is Apple?" letter (July '91, page 13), I couldn't help but notice a scientific faux pas in your reference to a "chromatographic query."

Color specification isn't *chromatographic*, it's *spectrophotometric*. Spectrophotometry deals with the transmission, absorption, or reflection of specific wavelengths of the electromagnetic spectrum. Chromatography deals with the separation of chemical mixtures by molecular size, structure, functional groups, ionic strength, solubility, or other chemical properties.

Glenn H. Lewis
Chicago, IL

Our faces are suitably spectrophotometrically altered. —JB

Seeing Red

A few comments about John C. Dvorak's "Rose-Colored Glasses" (July '91, page 292). He hit on some interesting issues comparing Macs and PC clones. Regardless of Win3, Macs do equal PCs in speed for word processing and graphics, but are somewhat slower in number crunching. However, raw speed isn't the be-all and end-all. Computing in the real world involves day-to-day tasks that are much more efficiently handled under the Mac's graphical user interface. The DOS programs I have used are much inferior to those on a Mac.

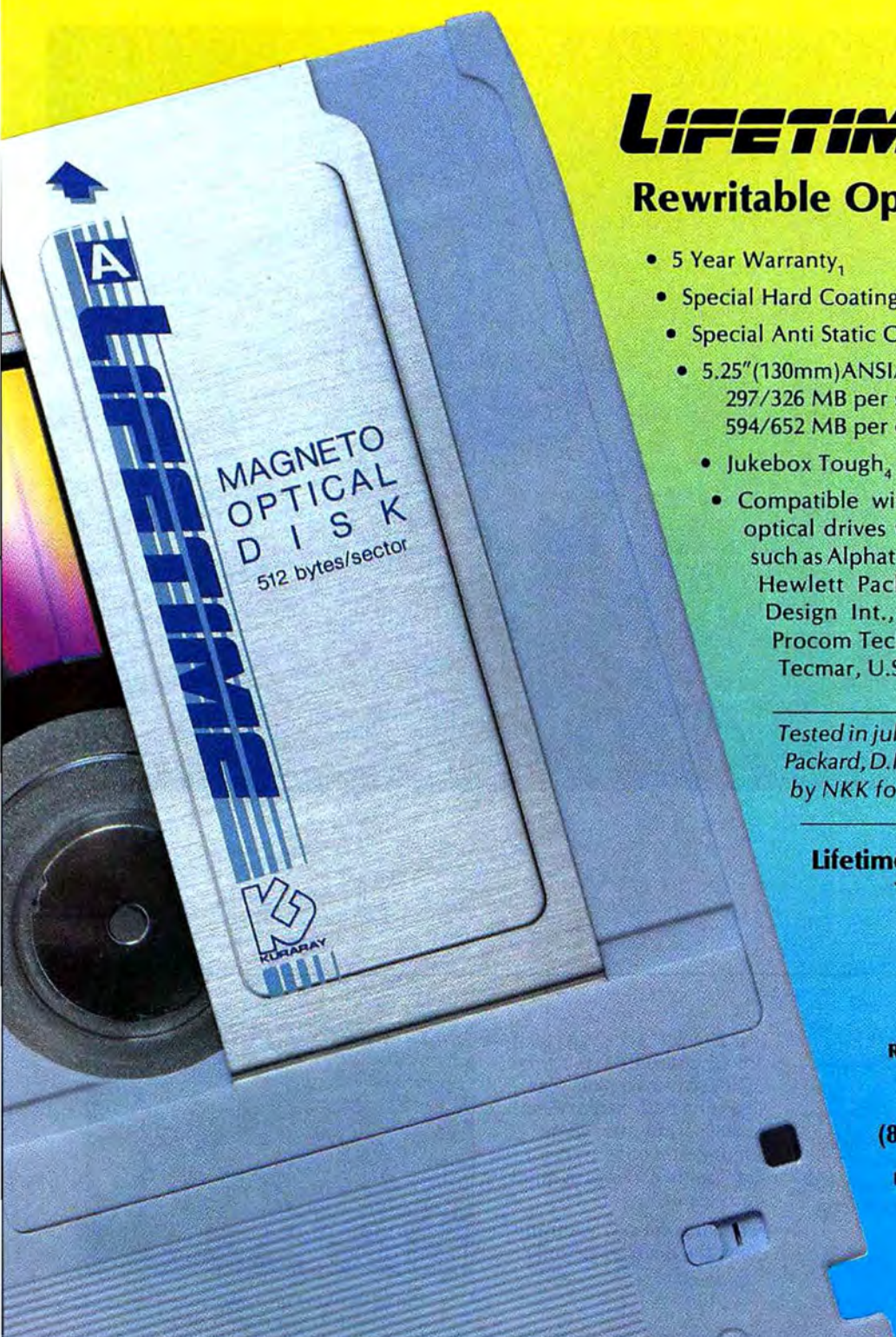
Atlanta's presentation to the World Olympics Committee was produced in the IBM Tower — on Macs. Why Macs? Because productivity (actually producing a product) is so much faster and easier with a Mac.

David L. Cox
Atlanta, GA

Clarifications

In "Gigadrives: The 1,000-Megabyte Solution" (July '91, page 140), the formatted capacity of the CMS PD1000S was incorrectly reported: The correct capacity is 990 megabytes. In the same article, the Microtech Nova N1000 was incorrectly listed as the Microtech MicroKCN N1000. Also, Norton Utilities and Total Recall were omitted from the list of bundled software for the Microtech Nova N1000.

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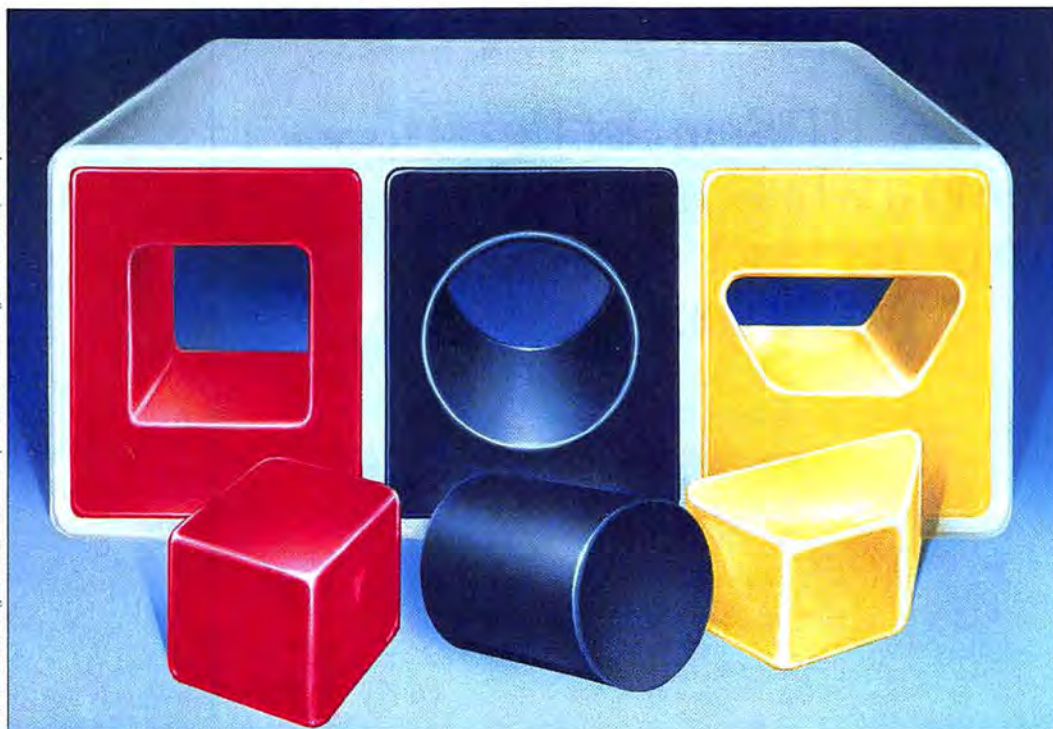
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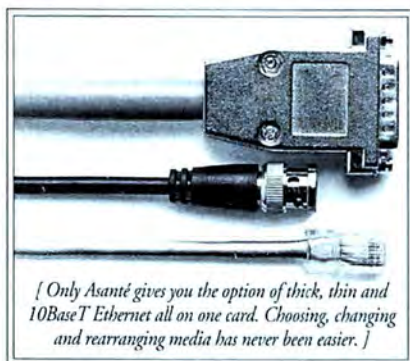
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Mo' Better Blue?



IBM and Apple, together at last! Is it a marriage of convenience — or necessity? Are they the oddest couple since Harry met Sally, or will they dance off into the sunset like Fred and Ginger? And what does it all mean for you?

It's a marriage made — well, not exactly in heaven. More like in Hollywood. After months of the cattiest courtship this side of "Moonlighting," Apple and IBM are finally tying the knot, technologically speaking.

Even before the prenuptial agreements are signed, long before the lawyers have figured out how to get as much mileage from a joint venture as from a lawsuit, and way before Kitty Kelley has even thought about the high-tech behind-the-scenes exposé that could make that Nancy Reagan book look like a tea party, the sideline speculation is running rampant.

So what's it all about?

Or, rather, what's it *not* about?

The two companies are not merging. They will remain the staunchest of staunch competitors. All they've agreed to is to work together on several key technologies.

First, and probably most important, is the announcement that Apple and IBM will merge their individual research on object-oriented operating-system software into a hybrid system that will run on IBM's RISC System/6000 POWER PC chip (to be manufactured by Motorola). The two companies will form a joint venture to create this operating system, which will be used by both parent companies and licensed to other parties. The POWER PC architecture will form the basis of the mother of all motherboards that will power future generations of the Macintosh.

Both companies bring a lot of object-oriented blood, sweat, and tears to the table. Apple has been working on an object-oriented approach to system software — code-named Pink — for several years.

The name *Pink* supposedly derives from the color of the index cards on which Pink's features were written. When Apple first set out to define the operating system of the mid-1990s, Apple engineers brainstormed about what features to include in the new system. The easier features were written down on blue index cards — and ultimately became System 7. The ones that would take longer were written on pink cards. Pink is now much more than a collection of index cards, although it's certainly not yet ready for prime time.

IBM's most visible object-oriented effort has been participation in a venture called Patriot Partners, started with Metaphor Computer Systems. Presumably pleased with the progress of Patriot Partners, IBM — taking a cue from another Patriots fan, Victor "I bought the company" Kiam — recently announced its

intention to buy Metaphor — lock, stock, and object — which now looks to be the likely home base for the new Apple/IBM venture.

Astaire-way to Heaven

Another agreement calls for the Mac to be more fully integrated into IBM's "client/server-enterprise environment." IBM and Apple will also codevelop a version of AIX, IBM's preferred flavor of UNIX, that will support Macintosh and OSF/Motif user interfaces.

In English this means that Apple doesn't want to be left out of IBM's big corporate deals and that IBM is at least a little nervous about not having a satisfactory answer when its best customers demand Mac-like ease of use. As senior editor Russ Ito puts it, what the two parties get out of the deal is best explained by film critic Pauline Kael's explanation of why Fred Astaire and Ginger Rogers made such a dynamic duo: Fred gave Ginger class, and Ginger gave Fred sex.

Finally, the two companies have committed to developing new multimedia technology as part of this software environment, and it will be made available to other vendors.

If everything goes according to plan, someday you won't have to check to make sure if you bought the Mac or the PC version of Flight Simulator. There'll be just one version; when you pop the floppy into your computer, the software will first check to see what kind of hardware you're using. The application will automatically put on the appropriate interface for you and scale its sound and graphics output to exploit the resolution, hardware, and processing power of your system.

This last area is one in which the two companies are likely to maintain fierce competitive differences. Apple will continue to target the multimedia high ground, with machines that offer CD-quality sound and high-definition video and graphics, whereas IBM's machines will have all the pizzazz of a \$20 boom box.

This all sounds harmless enough. So why are Apple employees up in arms? Why is there a rumor floating around that the members of the original Mac team are trying to recall the Mac Plus so they can scratch their names off the inside of the cases? And what does it mean for you?

Our armchair corporate psychoanalysis begins in Detroit in the 1970s. When the major U.S. auto makers started announcing joint ventures with their Japanese counterparts, the cry of "Buy American!" rang loud and strong.

It could hardly be otherwise; a country self-centered enough to call a purely domestic championship the "World" Series was not about to quietly concede first place in something as all-American as the auto industry.

But as Detroit discovered, when the stakes get high enough, there is no longer any such thing as being No. 1; cooperation is as important as competition.

The major players need to make sure the basic car designs are similar enough

that if you can drive one, you can drive them all. They need to work together to keep all of their major component vendors in business. They need to ensure the continuing existence of a trained work force. And they need to maximize productivity by sharing resources and expertise — without giving away the store.

Likewise, Apple simply can never become No. 1 in the computer industry. Not necessarily because it isn't the best, but because its own survival depends on no one — at least no one too big — losing. If Apple somehow drove IBM out of business tomorrow, Apple wouldn't win; it would soon follow suit, because the whole industry would quickly fall apart.

And just as Detroit missed the boat when Japan's compact, energy-efficient cars took the market by storm, Apple missed the first wave of laptop and notebook fever. To catch up fast, it had to do something big.


It's a Wonderful Life

Cross-platform, object-oriented, multimedia, enterprisewide, client/server computing is big, all right — at least if you're counting syllables. What it means is that developers can devote more of their time to thinking up new software ideas and fleshing out how their programs should work and less time to the actual process of writing lines of code. Developers can move from concept to finished product more quickly, so there's more incentive for them to create specialized tools that match vertical applications you need, such as legal billing or academic courseware. It also means that, rather than always being forced into the Ginsu-knife approach to software — it slices, it dices, it subtotals, it does Beziers — developers can afford to create small, focused little gems of software that do one thing and do it exquisitely.

Unless...

Unless the deal falls apart. In which case Apple wins. So far, Apple has given up nothing, but it has gained the IBM imprimatur. Just by sitting down at the negotiating table with Apple, IBM has given the Mac its indelible seal of approval, and no amount of backpedaling can take that away.

But the deal will happen. It will happen because it must happen. The alternative is more losses, layoffs, cutbacks, and restructurings — and no more company BMWs.

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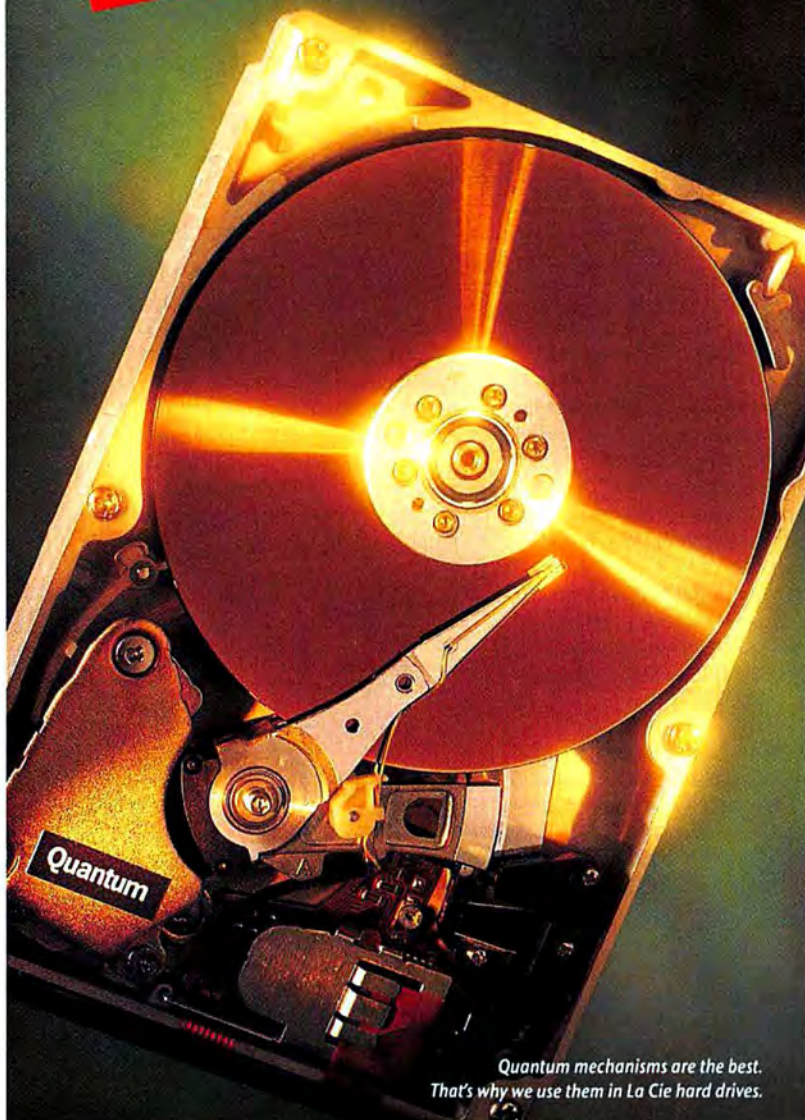
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MacUser says, "Silverlining is one of the most powerful and useful hard disk utilities you can find—most Apple engineers prefer it to Apple's own."

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6

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Frankly, there's been a lot of talk about La Cie hard drives. Leading Macintosh consumer magazines praise us. Customers write us fan letters. In fact, we're happy to let critics and customers have the last word about La Cie drives. Because they tend to be words like these:

★★★★★ —MacUser

... "The Good Housekeeping Seal. I'm now taking the safer course of buying from corporate-owned companies such as Quantum-backed La Cie..." —MacWeek



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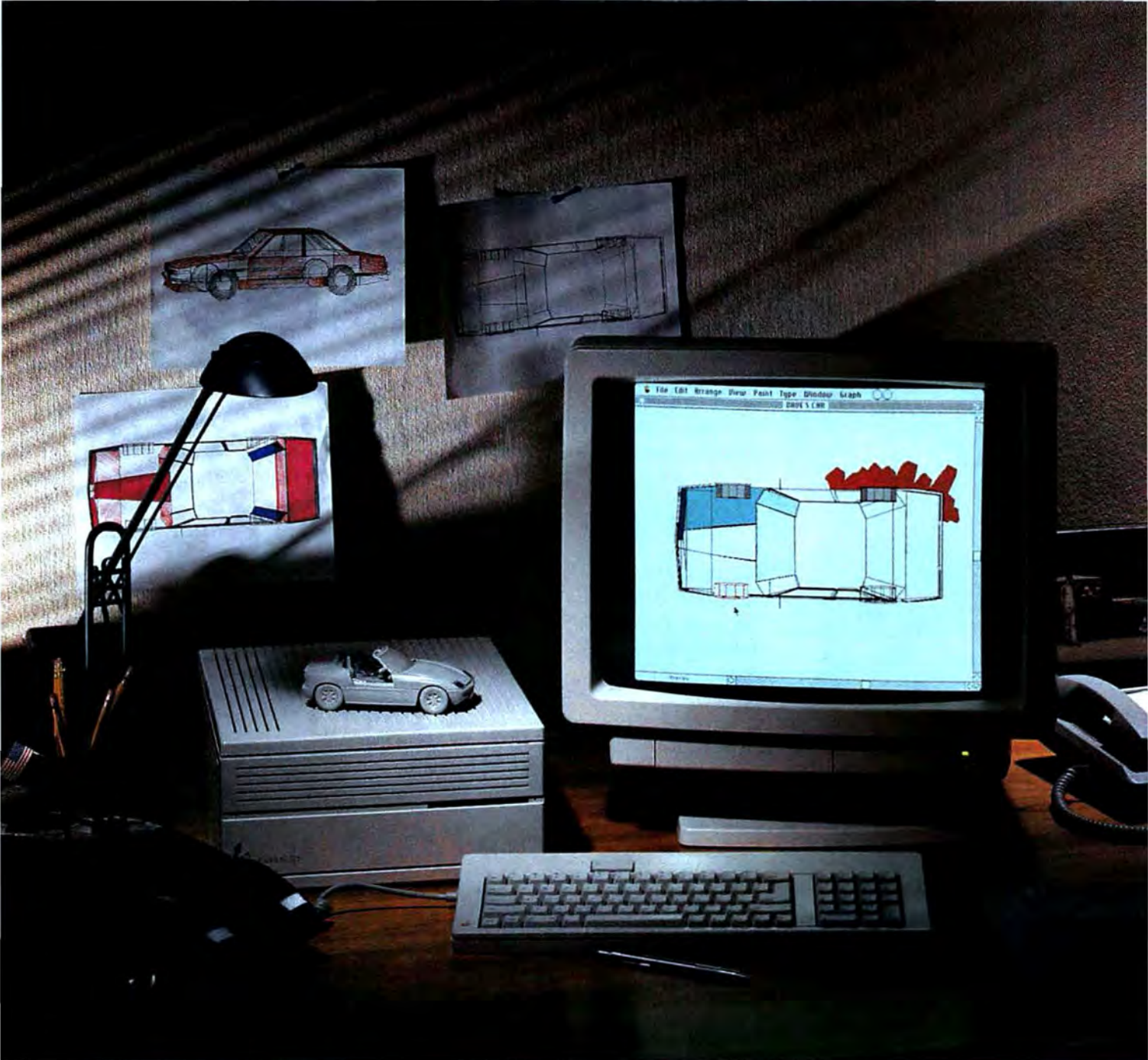
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My Life As a Wife



**We know what's
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you? Think hard
— it's someone
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I have a lot of free time these days. I never had this much before, because I was always one of those DOs (diligent Orientals), obsessed with overachievement. You know the kind: takes advanced-placement courses in high school, graduates early from college, gets an M.B.A. while working full-time, slaves at Apple, and starts a company.

I'm off the fast track now, because I realized that all men are cremated equal. What's the use of killing yourself as a corporate slave? Instead, I'm concentrating on leaving the best-looking corpse I can, and I'm also turning into a wife. This column is about what it's like to be a Macintosh wife.

You can be a Macintosh wife whether you're a man or a woman. I'm not being sexist, just empirically accurate. If this offends you, I'll send you the file for this column and you can substitute "hife" or "wusband" to make yourself happy. The point of this column is for you to appreciate your wife. You probably think that your life is hard and your wife's life is easy.

Parameter-RAM Caching

Be forewarned: This column has almost nothing to do with Macintosh. If you don't like it, I'm sure there's a feature story comparing parameter-RAM caching in the top 100 3.5-inch hard-disk drives somewhere in this issue. Also, if you're the wife of a Microsoft employee who emigrated from Singapore to search for political freedom, who likes to keep a machine gun around the house in case a herd of deer attacks, you'll probably dislike this column.

While you're at work mousing around, reading *MacWEEK*, pondering the impact of System 7 on INITs, and trying to stop Microsoft Word from unexpectedly quitting, we wives are at home suffering. You probably think that it's easy to keep a home and family running, compared with the stress of shipping a faster version of software and making sure there's lots of software for a computer with 128K of RAM built by a company whose role model seems to be a Latin American dictator. You're wrong.

It's not easy. Here are three reasons why. First, there is no support structure. At work, there are receptionists; secretaries; shipping clerks; and, God help us, management. At home, you face each crisis, no matter how small it may seem, all alone. Second, there is no camaraderie. At work, you can wander over

to the next cubicle to bounce ideas off colleagues or to commiserate. At home, there isn't a next cubicle at all. Frankly, it's often quite lonely being a wife. Third, there is little tangible feedback. At work, there are milestones such as finishing a project, shipping a product, and getting a performance review. At home, each day seems like the day before, and I doubt that most couples get together to review their performance.

The Gory Details

So that you may gain a greater appreciation of what it's like to be a wife, let me provide a tongue-in-cheek description of a wife's life. I'm explicitly telling you that it's tongue-in-cheek, because the minds of some readers are so fragmented that they can't tell when I'm kidding.

Eating a meal becomes an event. Eating takes on enormous importance — almost as much as reading E-mail — because it breaks your day into pieces: breakfast, before lunch, lunch, before dinner, dinner, and before breakfast. If you're a '90s wife like me, half of your meals are eaten at restaurants. (You'll know that eating is becoming important when you stop caring about the speed of service. From my perspective, I have to read the *San Jose Mercury News*, *San Francisco Chronicle*, and *The Wall Street Journal* anyway. I force myself to read *The Wall Street Journal* so that I can relate to my spouse's career.)

Because eating takes on such significance, so does exercising. Arnold Schwarzenegger would be proud: I lift weights two times a week and play basketball three times a week. The high point of lifting weights is often seeing professional athletes — such as Roger Craig, Jerry Rice, and Ronnie Lott — working out at the same time. It's kind of a male-bonding thing that transcends wifedom. The high point of playing basketball is watching the others hurry back to work without having lunch. I haven't gotten into aerobics yet, because I hate putting on makeup and crotch-floss outfits to work out.

Shop Till You Drop

Getting back to eating, you really *shop* for food. Shopping for food used to mean buying Jolt at the Seven-Eleven. It was GIGO shopping: Get In and Get Out. Now shopping for food takes on the significance of an off-site retreat; it means going to multiple markets because of their relative strengths. For

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GUY KAWASAKI

example, when I make pot roast, I go to one market to buy a specific brand of onion-soup mix. Then I make another trip to another market to buy a certain kind of meat. I once saw Steve Jobs at this market, and he told me, "If you ever want to do something *important* with your life again, contact me."

When you're a wife, you also really *cook* food. Cooking food used to mean opening the aforementioned Jolt and calling for a pizza. Not when you're a wife; when you're a wife, you cook from scratch because it uses up time and because it makes you feel like you're contributing to the happiness of your (working) spouse. I love to have a hot meal waiting at home for my spouse when she gets home from work. It really disappoints me when she gets home late and the food is cold. Later in this column, I'm going to provide my heretofore secret recipe for teriyaki chicken.

Pick-a-Little, Talk-a-Little

You hang around with other wives. My circle of daytime friends has changed from the likes of Randy Battat (a vice president at Apple) to his wife, Chris, and her two Portables: Scott and Alexandra. We always bump into each other at the market or at the mall. When we bump into each other, we always ask the obligatory questions: "How is Randy/Beth doing at work?" "Are you thinking of going back to work soon?" (Answer: "I'm taking some part-time work, but Randy/Beth really wants me to stay at home with the Portables.") I've heard from other wives — particularly the ones who used to be hotshot business executives — that there is no substitute for raising Portables. Nothing, it seems, could be more important or more satisfying than raising Portables.

You learn a lot of strategic things about running a home. Here are six. First, laundry that's been washed can stay in the washer for two days before it starts smelling bad and you have to wash it again. Second, laundry that has been dried can stay in the drier as long as your spouse doesn't need clothes. Third, putting water into dirty dishes and pots reduces the effort of washing them by 80 percent. Fourth, 20 percent of the dishes accounts for 80 percent of the usage (Pareto's law of dishes.) With proper selection, you never have to put dishes away. Fifth, you cannot go to the Price Club without spending at least \$200. (This is a very good omen for selling Classics in superstores.) Sixth, a

great deal of Price Club merchandise can fit into a Porsche 911.

You try to talk a lot to your spouse when he or she gets home. After being bored all day, you need to talk to an intelligent human being about something other than the rising cost of groceries. I always ask my spouse about her day so that I can live through her vicariously: "I met with the agency people from Foote, Cone, & Belding. We discussed the new ads we're shooting with Spike Lee. My ad budget has been increased to \$25 million. How was your day?" I'd worked out and then had a café mocha and then gone marketing (*food* marketing, not strategic, "Helocar" marketing).


Finger-Lickin' Teriyaki Chicken

You may not have noticed, but I try to write columns that provide information my readers can use. This month, instead of tips on how to use PageMaker or Photoshop better, I'm going to provide my world-famous teriyaki-chicken recipe. Ingredients: two pounds of assorted chicken parts, two cups of high-sodium soy sauce, two cups of sugar, one cup of chopped green onions, two tablespoons of minced ginger, two minced jalapeño peppers, and two tablespoons of sesame-seed oil.

Directions: combine all the ingredients except the chicken. Mix well (I use the Cuisinart that Jean-Louis Gassée gave us for our wedding gift). Add the chicken, and let it all marinate for two to three hours. Remove the chicken from the mixture, and microwave the chicken for 15 minutes at the highest temperature setting. Barbecue it to complete cooking and to add color to the skin. The chicken is done when the flesh starts to pull away from the knuckles of the bones.

Sick of Stacks

Some of you may contact me because you are sympathetic to my need for a career. Some of you will even send me HyperCard stacks that you think are the next Lotus 1-2-3 (the PC version, not the Mac version). Save your disks, because I like being a wife as much as I hate looking at HyperCard stacks.

On the other hand, you could send me your favorite recipe (but please don't send me any software for keeping track of recipes). The most important thing for you to do, however, is to tell your wife how much you appreciate him or her. I've got to go. It's time for basketball and then lunch and then marketing. 



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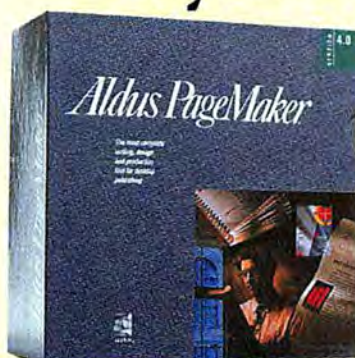
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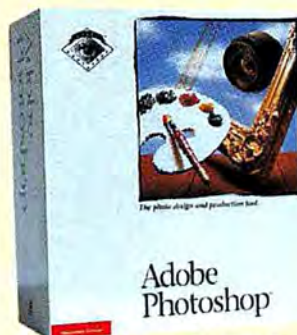
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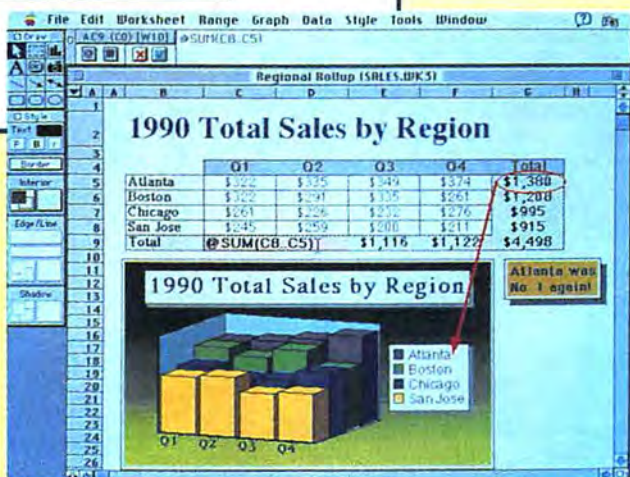
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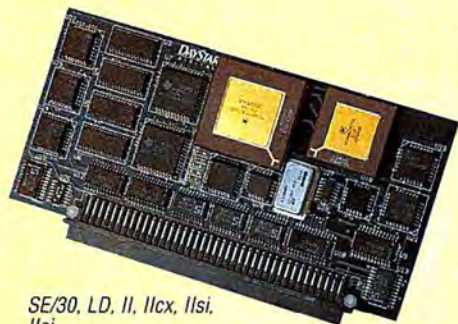


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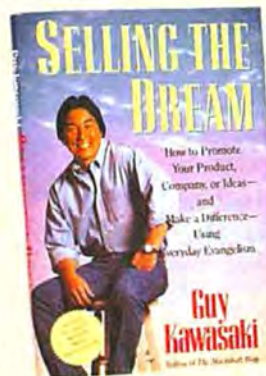
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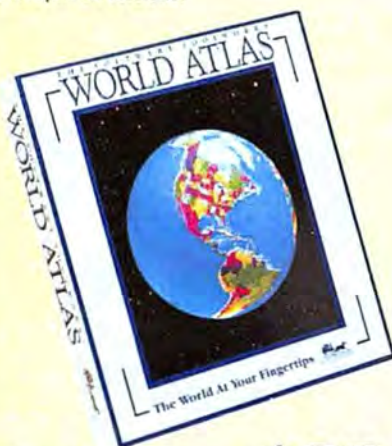
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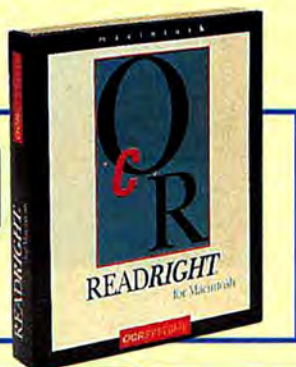
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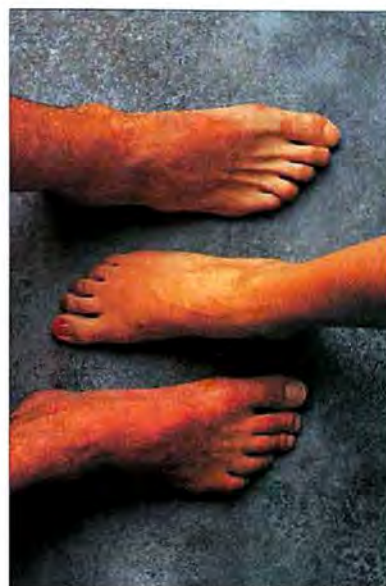
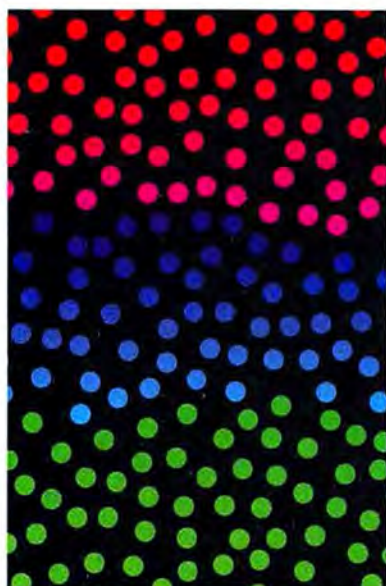


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The Desktop Blackboard



Apple's long been 'the education computer company,' but the best Mac education tool isn't Apple's — it's Stephen Wolfram's.

Ah, autumn: Once more it's back-to-school time for those teachers who still have jobs and for those students who still have schools.

Apple believes in education, particularly in computer-assisted education. More particularly, in computer-assisted education that doesn't cost an arm and a leg, judging by a program Apple is collaborating on with LucasFilm Learning, The Marin (California) Community Foundation, and the San Rafael (California) School District.

Apple itself has only recently begun to stop extracting arms and legs from its customers, but in an excess of that faux-Islamic zeal so common among recent converts to religious doctrines such as competitive pricing, it has attempted to atone for its past transgressions by cutting off 10 percent of its hands. Among the surviving Apple hands are those with a finger in MacMagic, the aforementioned project, which is exploring how the computer (i.e., the Mac) can be used effectively in the classroom. The emphasis, according to LucasFilm's Karla Kelly, is not on rote drill-and-practice but on using the computer as a tool for expressing ideas and exploring connections between ideas.

One Mac, One Class

The emphasis is also on discovering ways to make it all work in a classroom that has only one computer, it seems. That sort of attempt to improve education — in the face of realistic expectations regarding America's willingness to invest in it — may explain why the project is called MacMagic.

Dealing with single-computer classrooms won't be a problem in the Whittle Schools, if Whittle Communications is able to work its magic. Whittle is the company responsible for the infamous Channel One, the ten-minute-news-program service for schools that generated so much controversy by carrying commercials into the classroom (the commercials pay for the service).

Flushed with this programming triumph, entrepreneur Chris Whittle, who views himself as an inventor rather than as an educator, has embarked on an ambitious program to redefine the American classroom, with a blend of free enterprise and high technology. Whittle hopes to open 200 schools by 1996, growing to 1,000 schools by the year 2000; to provide significantly better education than is the current American norm at no greater cost per

student; and to make a profit in the bargain.

A bargain with the cloven-footed, you may say, assuming that Whittle's magic formula probably involves more commercials in the classroom, but at least he has a program and it's not elitist. Although the plan would put a computer on every student's desk and maybe another in every student's home, the computer technology involved would be the kind already being used by some innovative teachers.

A Classic Education

Those teachers who could get away from their summer jobs in June to attend this year's National Education Computing Conference (NECC) in Phoenix saw a variety of innovative uses of computer technology in education. There as well, much of the creativity went into working out how to make do with low-cost equipment: Mac Classics, Apple IIs, HyperCard, and carefully cost-justified CD-ROMs and videodisc players.

Well, something needs to be done.

Literacy is on the decline in America, and not just in the Oval Office. What teacher and author David Guterson calls "the sorry state of American education" has driven him and many other teachers to pull their children out of the very public schools that, however poorly, pay their salaries. And federal, state, and local governments, and by implication the taxpayers — you and I — are unable or unwilling to spend the money necessary to address the problems.

All of which makes the deus ex machina (or even deus ex PChina) summoned by MacMagic, Whittle, NECC exhibitors, and their ilk, seem much like the Holy Grail. But at the risk of coming across as elitist and with no pretense of being an educational expert, I'd like to call your attention to a grail of a different denomination.

Actually, it was disingenuous of me to speak of the risk of seeming elitist. What I'm about to describe is obviously, wildly elitist: an instructional technology that requires a Mac II with 5 megabytes of RAM and hundreds of dollars' worth of software per student — just to teach math. But what is elitist today is generic tomorrow, and problems that we have worked so long to create won't be solved in a day.

It was also disingenuous of me to disavow any pretense of educational credentials. Although it is true that I have no more educational credentials than does Chris Whittle, I am just as pretentious, in my own way. Like most

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MICHAEL SWAINE

writers, I'm really a professional student. In educational matters, I figure that that entitles me to speak for the victim.

From which perspective, it looks as if more people have been hurt by bad teaching of mathematics than of any other subject. I believe the American educational system does a much better job of teaching math anxiety than of teaching math, perhaps because math teachers themselves suffer from math anxiety — I don't know. The best system for teaching mathematics, still from the victim's perspective, would surely be one that got the teacher out of the way as much as possible and let the student explore the domain, discover relationships, make generalizations. It would be one that would stretch the subject out on the slab and let students poke it.

Mathematica for Kids?

Mathematica, a program from Wolfram Research, of Champaign, Illinois ([217] 398-0747), does that. Mathematica is a simulation of a large chunk of mathematics, designed for scientists, engineers, and college students in fields that require math, and it is very successful in those markets. Now some radicals are using it with elementary-school students, with some radical results.

In the book *Exploring Mathematics with Mathematica* by Theodore W. Gray and Jerry Glynn (Redwood City, California: Addison-Wesley, 1991), Glynn describes his experience teaching in something called The Math Program, in which he has been using Mathematica routinely with students of various ages. The "greatest potential for progress," he says, "is with the younger students."

Mathematica lets you set up what are called notebooks, containing text, sound, graphics, animations, and mathematical expressions that evaluate when told to do so. This is a good way to construct study units, textbooks as it were, but it is just as possible, after some orientation to the program, to leave a second-grader in front of raw Mathematica in its normal mode of evaluating whatever the user types in. This proves to be enlightening. In one case described in the book, Glynn showed a second-grader how to multiply 5 times 12. He typed

$5 * 12 == 5 * 10 + 5 * 2$
and Mathematica responded
"True."

He then gave the student another multiplication problem and let her work on it,

stopping back at her desk from time to time to suggest a new problem or to offer encouragement. She rang the changes on the concept for half an hour, demonstrating complete mastery of the concept.

In another case, Glynn taught a fourth-grader about equations. He typed

Solve [2x+1==7, x]
and Mathematica responded
{{x->3}}.

He explained that x represents any number; that if x is 3, the equation is true; and that this is what it means to solve an equation — then he gave her another example. Soon, she was solving equations on her own, and in this same way she was able to learn quadratic equations and predict the roots of new equations.

Glynn is more interested, in his discussion of these examples, in what the students were doing than in the impressive results they were able to achieve. Mathematica retains the protocol of input and output on-screen for the student (and the teacher) to examine, and Glynn has studied the students' protocols to see what and how they learn and how they use Mathematica. Sometimes the students merely repeat what they've been taught, but frequently they extend the examples presented in obvious or novel ways. Altering the input is the main variable under the students' control, and so it is natural for them to try the same problem on different numbers. Which is what mathematics teachers and textbooks are getting at with rote drill-and-practice; with Mathematica, however, the students do it on their own initiative.

Some of the basic things Mathematica does could be done with a calculator or with a less memory- and processor-hungry piece of software. But the point of Mathematica is that it *is* math. That is, it's a simulation of some of math, allowing students to explore the domain rather than just follow the syllabus. Like any good simulation, it has the advantages of a field trip or a laboratory course without the insurance premiums or cleanup costs. And it is a very good simulation.

The quality of the simulation is more important to seven-year-olds than to scientists or engineers or college students, because the kids don't know how to spot holes in the simulation. They trust the program, and what it tells them about math they will accept. Fortunately, Mathematica mostly tells the truth about mathematics.

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No doubt you've read a lot about System 7. But what will it do for you? Recently, *Macworld* Contributing Editor Lon Poole—an extremely System 7-savvy kind of guy—visited the production studios of PCTV® and helped us put together a video that makes the power of System 7 perfectly clear. It's free with any order over \$100. Or you can buy one for just \$9 (2244). We also have Lon's book *Macworld Guide to System 7* for sale, for \$19 (2238).

Products preceded by the symbol ⑦ are compatible with **System 7**. For specific features of System 7, please ask your salesperson at the time of your order.

Companies participating in the 30 or 60 day **Money Back Guarantee** program are highlighted in red. If you are not satisfied with your purchase of any of these products, call us for an authorization and return it with all of the original packaging within the guarantee period for a refund check (or credit on your credit card). We reserve the right to limit quantities on such returns.

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DAILY BUSINESS

ACCOUNTING, DATABASES, SPREADSHEETS, WORD PROCESSING

★Aatrix Software ... 30 day MBG

5872 ⑦ Checkwriter II 3.2 ... 32.



ElseWare Corp. ... 30 day MBG

1506 ⑦ *DataShaper 1.2*—The top selling PageMaker companion product, DataShaper is a catalog and directory production lifesaver. Automatically formats your database text files when they are imported into PageMaker \$135.

Microsoft ... 30 day MBG
2565 ⑦ *Microsoft Project 1.1*—Effectively schedule tasks & manage resources. Gives unlimited ways to view project information, boardroom-quality reports & presentations, resource scheduling across multiple projects & more... \$449.

Abacus Concepts

4482 ⑦ StatView SE + Graphics 1.03 ... 199.
4481 ⑦ StatView II 1.03 ... 309.
⑦ SuperANOVA 1.1 (Plus, SE or II) ea. 309.

★Acius ... 30 day MBG

⑦ 4D Write 1.0.1 or ⑦ 4D Calc 1.0 229.
5618 ⑦ 4th Dimension 2.2 ... 485.
6948 ⑦ File Force 1.1 ... 249.

★Advanced Software ... 30 day MBG

5608 ⑦ DocuComp 1.5 ... 89.

A Lasting Impression

⑦ ResumExpert or Cover Letters ea. 48.
⑦ ResumExpert Software Series ea. 48.

Ashton-Tate

1324 FullWrite Professional 1.0... special 39.

★Avery ... 60 day MBG

7446 ⑦ MacLabel Pro 1.0 ... 48.

★Baseline Publishing ... 30 day MBG

8881 ⑦ Thunder 7 1.0.4 ... 56.

★Chang Labs ... 30 day MBG

1611 ⑦ C.A.T. 3.0 ... 279.

★Checkfree Corp. ... 30 day MBG

6928 ⑦ Checkfree Mac 1.5 ... 19.

★CheckMark Software ... 60 day MBG

5862 ⑦ Payroll 4.5 ... 175.
5863 ⑦ MultiLedger 2.0 ... 235.

Claris

1129 ⑦ MacWrite II 1.1V1 ... 139.
8216 ⑦ FileMaker Pro 1.0V2 ... 215.
1125 ⑦ MacProject II 2.1V3 ... 359.

★Deneba Software ... 30 day MBG

1768 Coach Professional 3.1 ... 124.

★DeltaPoint ... 60 day MBG

8967 ⑦ Taste 1.01 ... 97.

★Dow Jones ... 30 day MBG

1942 ⑦ Market Analyzer Plus 2.0 ... 225.

★ElseWare Corp. ... 30 day MBG

1506 ⑦ DataShaper 1.2 ... 135.

Fox Software

5572 ⑦ FoxBASE +/Mac 2.01 ... 289.

★Franklin Software ... 30 day MBG

7070 Language Master 2.0 ... 45.

Good Software

2527 REM's Property Manager ... 339.

Individual Software

6222 Resume Maker 1.3 ... 29.

Informix

4955 ⑦ Wingz 1.1A ... 245.

★Intuit ... 30 day MBG

2507 ⑦ Quicken 3.0 (August '91) ... \$42.

★Kaetron Software ... 30 day MBG

8941 ⑦ TopDown 3.0 ... 219.

★Mainstay ... 30 day MBG

7718 ⑦ MacFlow 3.54 ... 169.

★MECA ... 60 day MBG

2796 ⑦ Managing Your Money 4.0 ... 99.

★Microlytics ... 60 day MBG

9729 ⑦ Strunk & White's Elements of Style 34.

7506 ⑦ Inside Information 1.0 ... 68.

7820 ⑦ Random House Encyclopedia 1.0 68.

★Microsoft ... 30 day MBG

2572 ⑦ Schedule Plus 1.0 ... 129.

2884 ⑦ Works 2.00D ... 159.

4969 ⑦ Word 4.0D ... 245.

9803 ⑦ Excel 3.0 ... 309.

2565 ⑦ Project 1.1 ... 449.

5454 ⑦ The Microsoft Office 1.5 ... 525.

1420 Excel 3.0 Companion Book ... 20.

★Niles & Associates ... 30 day MBG

5048 ⑦ EndLink 1.1.3 ... 58.

4602 ⑦ EndNote 1.3 ... 85.

8010 ⑦ EndNote Plus 1.0 ... 145.

★Nolo Press ... 30 day MBG

4228 ⑦ For the Record 2.0 ... 30.

2981 ⑦ WillMaker 4.0 (not valid in LA.) ... 35.

OCR Systems

9926 ReadRight 1.0 ... 309.

★Odesta ... 30 day MBG

5621 ⑦ Double Helix III 3.5 ... 439.

6468 ⑦ DataDesk 3.0 ... 459.

Paragon Concepts

5683 ⑦ Nisus 3.06 ... 245.

★Portfolio Systems ... 30 day MBG

7992 ⑦ DynoPage 1.0 ... 72.

6916 ⑦ Dynodex 2.0 ... 72.

★PowerUp ... 30 day MBG

7696 ⑦ Calendar Creator 1.01 ... 44.

7697 ⑦ Letter Writer Plus 1.01 ... 56.

7694 ⑦ Address Book Plus 2.0 ... 56.

7698 ⑦ Fast Forms 2.0 ... 112.

★Provue ... 60 day MBG

4582 ⑦ Panorama II 2.0 (August '91) ... 245.

★Que Corp. ... 30 day MBG

7482 ⑦ RightWriter for the Mac 3.1 ... 54.

★Reality Technologies ... 30 day MBG

6929 ⑦ WealthBuilder 1.01 ... 95.

DYNOPAGE



Portfolio Systems ... 30 day MBG

7992 ⑦ DynoPage 1.0—Prints any Mac file—double-sided—to organizer pages! ... \$72.

6916 ⑦ Dynodex 2.0—Fastest address manager.

Print double-sided organizer pages, labels ... 72.

7448 Dynodex Paper—Publish your organizer! 14.

is now on the scene.

- ★ **Reference Software ... 30 day MBG**
 6268 ⑦ Grammatik Mac 2.0 \$58.
Round Lake Publishing
 ⑦ LetterWorks, Sales or Legal . ea. 52.
 ★ **Shana ... 30 day MBG**
 8201 ⑦ Informed AutoForm 1.1 75.
 8810 ⑦ Informed Manager 1.0.1 99.
 7692 ⑦ Informed Designer 1.1.1 159.
 ★ **Softsync/BLOC ... 30 day MBG**
 7129 ⑦ Accountant, Inc. 2.1.1 339.
 ★ **Software Discoveries ... 30 day MBG**
 8118 ⑦ RecordHolder Plus 3.1 85.
Software Toolworks
 8366 ⑦ Dollars & Sense 5.0 59.
 ★ **Spyglass ... 60 day MBG**
 2033 ⑦ Format 1.1 (August '91) 159.
 2028 ⑦ Dicer 1.1 (August '91) 399.
 2027 ⑦ Transform 2.0 399.
 ★ **Survivor Software ... 30 day MBG**
 3289 ⑦ MacMoney 3.52 59.



SoftSync/Bloc ... 30 day MBG
 7129 ⑦ *Accountant, Inc. 2.1.1*—"The most complete integrated accounting and financial management package for the Mac" (MacUser 3/91). Includes Invoicing, Inventory, Receivables, Payables, Payroll & General Ledger \$339.

- ★ **Symantec ... 30 day MBG**
 2237 ⑦ GreatWorks 1.0 205.
 3422 ⑦ More 3.0 265.
 ★ **Synergy ... 30 day MBG**
 6617 ⑦ KaleidaGraph 2.1.3 150.
 ★ **Teleware ... 30 day MBG**
 7616 ⑦ M.Y.O.B. 2.07 139.
 ★ **TIMESLIPS ... 30 day MBG**
 8939 Accounting Link 1.0 52.
 2986 ⑦ Timeslips III 2.0H 194.
 ★ **T/Maker ... 30 day MBG**
 3639 ⑦ WriteNow 2.2/Grammatik Mac . . 119.
 7360 ⑦ WriteNow (3-Pack) 245.
 8206 SmartBundle (4 programs in one!) . 215.
 ★ **Williams & Macias ... 30 day MBG**
 6926 ⑦ myDiskLabeler III 3.3 42.
 4976 ⑦ StickyBusiness 1.5 51.
 ★ **WordPerfect ... 60 day MBG**
 3800 ⑦ WordPerfect Mac 2.0.1 279.
 ★ **Wordstar ... 30 day MBG**
 6984 ⑦ Correct Grammar 2.0 55.



Shana ... 30 day MBG
 A comprehensive intuitive software solution for forms design, management & data collection.
 7692 ⑦ *Informed Designer 1.1.1* \$159.
 8810 ⑦ *Informed Manager 1.0.1* 99.
 8201 ⑦ *Informed Autoform 1.1* 75.

GRAPHICS & DESIGN PUBLISHING, PRESENTATIONS

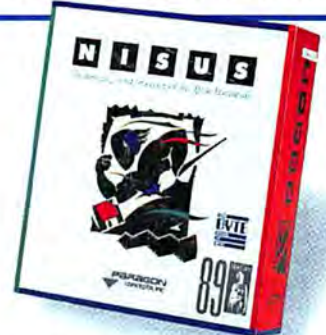
- ★ **Abbott Systems ... 30 day MBG**
 8052 ⑦ Cheshire 1.0 62.
Adobe Systems
 6957 ⑦ Adobe Type Reunion 1.04 41.
 8794 Adobe Type On Call 47.
 5750 ⑦ Adobe Type Manager 2.0 59.
 6053 ⑦ Adobe Plus Pack 118.
 6156 ⑦ Adobe Plus Pack/ATM 174.
 6098 ⑦ TypeAlign for ATM 1.0.4 62.
 ⑦ Adobe TypeSets for Business . ea. 95.
 6671 ⑦ Adobe Type Set 1 or 6677 ⑦ Set 2 62.
 7587 ⑦ Adobe Type Set 3 125.



TIMESLIPS ... 30 day MBG
 2986 ⑦ *Timeslips III 2.0H*—Fast, easy, accurate time and billing for service professionals. \$194.
 8939 *Accounting Link 1.0*—Now links with general ledger accounting programs 52.

- 8042 ⑦ Adobe Type Sets 1-2-3 Bundle \$239.
 8171 ⑦ Adobe Illustrator 3.0.2 (w/ATM) . 379.
 6644 ⑦ Adobe Photoshop 2.0 (July '91) . 549.
 5001 ⑦ Streamline 2.0 122.
 ⑦ Smart Art I, II, III, or IV. ea. 62.

- ★ **Aldus ... 30 day MBG**
 2461 ⑦ Aldus Gallery Effects 1.0 144.
 6674 ⑦ Aldus Personal Press 1.0.1 211.
 3506 ⑦ Aldus SuperPaint 3.0 (Aug. '91) . 144.
 3980 ⑦ Aldus Digital Darkroom 2.0 279.
 3507 ⑦ Aldus Super 3D (August '91) . . 349.
 7467 ⑦ Aldus PrePrint 1.5 349.
 4751 ⑦ Aldus Persuasion 2.0 349.
 1330 ⑦ Aldus FreeHand 3.0 419.
 7088 ⑦ Aldus PageMaker 4.01 549.
 8054 ⑦ Aldus Design Team (includes PageMaker, FreeHand & PrePrint) . 899.
Altsys
 9806 ⑦ Metamorphosis Pro 2.0 89.
 1195 ⑦ Fontographer 3.3 265.
 1983 ⑦ EPS Exchange 1.0 89.



Paragon Concepts
 5683 ⑦ *Nisus 3.06*—Boasts ten clipboards, unlimited undos, noncontiguous selection, and a lightning-fast search/replace that can even check unopened files. Plus: graphics and two macro levels for custom features. \$245.

- ★ **Ares Software ... 30 day MBG**
 8878 ⑦ FontMonger 1.0 62.
 ★ **Baseline Publishing ... 30 day MBG**
 8055 ⑦ Screenshot 33.
 7784 ⑦ Color MacCheese 56.
 7828 ⑦ Exposure Pro 78.
Bitstream
 9428 ⑦ True Type Fonts 1 or 9429 Fonts 2ea. 59.
 1591 ⑦ True Type Fonts 3 or 1595 Fonts 4ea. 98.
Broderbund Software
 9351 ⑦ Kid Pix 1.1 29.
 1427 ⑦ The Print Shop 1.3.2 35.
 6281 ⑦ TypeStyler 1.5.2 115.
 ★ **Casady & Greene ... 60 day MBG**
 8879 ⑦ Fluent Font Library 4.0 99.
 1945 ⑦ True Type Starter Set 57.
Claris
 1123 ⑦ MacPaint II 2.0 89.
 2518 ⑦ MacDraw Pro 285.
 8007 ⑦ Claris CAD 2.0 629.

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Paracomp ... 30 day MBG

7441 **Swivel 3D Professional 1.0**—One of the best selling 24-bit 3D programs available \$435.
7839 **FilmMaker 2.0.1**—Features full animation, anti-aliasing and transparency for multimedia presentations. 435.

★Creative Software ... 30 day MBG

6645 **Easy Color Paint 2.0** 45.
Custom Applications
8037 **Freedom Press Light 3.01 (17 fonts)** 55.
6517 **Freedom of Press 3.01 (35 fonts)** 255.

★DeltaPoint ... 60 day MBG

6095 **DeltaGraph 1.5** 125.

★Deneba Software ... 30 day MBG

6365 **UltraPaint 1.03** 125.
1769 **Canvas 2.1.1 (free upgrade to 3.0)** 189.

★Dream Maker ... 30 day MBG

Clippings: Sports or Business ea. 68.
Electronic Arts

4315 **Studio/8 2.0** 189.
8056 **Studio/32 1.1** 449.

★Foundation Publishing ... 60 day MBG

6728 **Comic Strip Factory 1.6** 36.
9438 **Comic Strip/People & Kid Stuff** 71.

★IDD/Innovative Data Design

2417 **MacDraft 2.1** 279.
4707 **Dreams 1.1** 419.

★Letraset ... 30 day MBG

2619 **ImageStudio 1.7** 139.
4709 **LetraStudio 2.0** 139.
2621 **Ready Set Go! 4.5A** 165.
6301 **ColorStudio 1.5** 599.

★Linguist's Software ... 60 day MBG

Over 100 language fonts. call

★Mainstay ... 30 day MBG

9798 **Capture 4.0** 75.

★MediaLab Tech. ... 30 day MBG

9725 **PictureAccess (photo scanning)** 169.
8218 **PictureLink 1.1** 215.

★MicroFrontier ... 30 day MBG

7886 **ENHANCE 2.0** 235.

★MicroMaps ... 30 day MBG

7554 **MapArt (Paint)** 41.
7556 **MapArt (PICT) or 7555 (EPS)** ea. 95.

★Microsoft ... 30 day MBG

2878 **PowerPoint 2.01D** 245.

★Monotype Typography ... 30 day MBG

Monotype Imprints-TrueType ea. 22.
Classic Fonts (full line available) call

★Multi-Ad Services

8767 **Multi-Ad Creator 2.5** 455.

★PANTONE

7466 **Process Color Imaging Guide** 48.
1862 **Process Color System Guide** 48.

★Paracomp ... 30 day MBG

5028 **ModelShop 2.0** \$599.
7728 **SwivelArt 1.0** 81.
2460 **MapArt I-North & South America** 156.
2459 **MapArt II-Europe, Africa, Asia** 156.
2458 **Viewpoint-Car Collection** 156.
2457 **Viewpoint-Air & Sea Collection** 156.
2463 **Viewpoint-Anatomy Collection** 156.
7441 **Swivel 3D Professional 1.0** 435.

★Postcraft International

2210 **Effects Specialist** 95.
Layouts for PageMaker, ReadySetGo, & QuarkXPress ea. 69.
Layouts: Stationery or Flyers ea. 45.
Quark

7612 **QuarkXPress 3.1** 519.

★Springboard ... 30 day MBG

3530 **Certificate Maker 2.02** 22.

★Strata

7773 **Stratavision 3D 2.0** 549.

★SuperMac Tech. ... 60 day MBG

3380 **PixelPaint 2.1** 149.
5625 **PixelPaint Pro 2.0** 499.

★Tactic Software ... 30 day MBG

8251 **Icon It! 2.1** 44.
8252 **Magic Typist or 8249 Art Fonts** ea. 49.
8263 **Art Clips 1** 49. **8261 Art Clips 2** 64.
8248 **FontShare 2.2** 129.

★3G Graphics

3942 **Images with Impact: Graphics 1** 49.
4583 **Images with Impact: Business 1** 64.
2003 **Images with Impact: People 1** 94.
6379 **Accents & Borders 1** 64.

★Timeworks ... 30 day MBG

7115 **Publish It! Easy 2.11** 139.

★T/Maker ... 30 day MBG

Full line available.
ClickArt (bitmapped) ea. 32.
ClickArt (EPS format) ea. 82.
1292 **Color Graphics Presentation** 109.

★Ventura Software

8962 **Ventura Publisher 3.0** 499.

★Visual Business Sys. ... 30 day MBG

9867 **GraphMaster 1.1** 189.

★Wildflower ... 30 day MBG

6512 **SnapJot 3.01** 31.

★Zedcor ... 60 day MBG

3986 **DeskPaint & DeskDraw 3.0.3** 113.



Argosy Software ... 30 day MBG

7872 **Software Bridge/Mac 2.0.1**—Translate documents between over 30 Mac and PC word processors. Mount DOS disks. \$99.
2448 **Run PC/Network**—Connect to a PC and run DOS programs. Incl. Software Bridge. 279.



Paracomp ... 30 day MBG

SwivelArt Collections—Detailed 3D models to use in graphics and presentation applications. Customized by illustrators and multimedia specialists (Map #1-Americas, Map #2-Europe, Anatomy, Air & Sea, and Cars). . . . ea. \$156.

PROGRAMMING

UTILITIES, HYPERCARD, SECURITY

★Abbott Systems ... 30 day MBG

2515 **Calc+ 1.0** 39.
5236 **CanOpener 1.1** 62.

★Advanced Software ... 30 day MBG

8051 **Intouch 1.1** 39.
9986 **Intouch Networking (3-Pack)** 112.

★Affinity Microsystems ... 60 day MBG

7835 **Tempo II Plus 2.0.3** 105.

★After Hours Software

1352 **TouchBASE 2.0** 79.

★Aladdin Systems ... 30 day MBG

6169 **Shortcut 1.5** 45.
6740 **StuffIt Deluxe 2.0** 62.

★Aldus ... 30 day MBG

5100 **Aldus SuperCard 1.6** 211.

★ALSoft ... 30 day MBG

9807 **DiskExpress II 2.07** 53.
9808 **MasterJuggler 1.53** 53.
9886 **MultiDisk 1.27** 53.

★Apple Computer/Clariss

1074 **System 7 (with free PCTV video)** 99.
8734 **HyperCard Development Kit 2.1** 149.

★Argosy Software ... 30 day MBG

7872 **Software Bridge/Mac 2.0.1** 99.
2448 **RunPC/Network** 279.

★ASD Software ... 30 day MBG

9440 **MaccessCard Reader** 299.
9439 **MaccessCard/FileGuard (1) Bundle** 399.
7085 **FileGuard 2.7 (1 user)** 139.
7422 **(5 user)** 489. **7423 (10 user)** 799.

★Baseline Publishing ... 30 day MBG

7783 **INIT Manager** 34.

★Berkeley Systems ... 30 day MBG

5737 **After Dark 2.0T** 28.
2198 **More After Dark (M.A.D.)** 23.
2196 **After Dark & M.A.D. Bundle** 42.
1541 **Stepping Out II 2.02** 54.

★Bright Star Technology

2614 **At Your Service** 30.

★Casady & Greene ... 60 day MBG

2269 **QuickDEX 2.0** 34. **2528 (5 Pak)** 99.
7443 **A.M.E. (1 user)** 159. **7831 (10 user)** 849.

what this will mean?



Palomar Software ... 30 day MBG
 8210 **PLOTTERgeist 2.0**—System 7-savvy Chooser-level driver connects plotters to your Mac. First to provide presentation-quality True Type and ATM text; also features background plotting and easy-to-use interface \$249.

★CE Software ... 60 day MBG

1727 **CalendarMaker 3.0.1** 31.
 6278 **DiskTop 4.01** 63.
 7518 **Alarming Events 1.03** 84.
 8024 **QuickKeys 2.1** 94.

★Central Point ... 30 day MBG

5041 **Mac Tools Deluxe 1.2** 79.

★Connectix ... 30 day MBG

7830 **Maxima 2.0** 45.
 1563 **Virtual 3.0 (August '91)** 74.
 6647 **HandOff II 2.2** 56.
 1914 **Mode 32 1.0** 95.

★Dantz Development ... 30 day MBG

5255 **Retrospect 1.3** 147.
 7945 **Retrospect Remote 1.3** 264.
 7946 **Remote (10 Pack of inits)** 147.

★Digitalk ... 60 day MBG

5166 **SmallTalk/V Mac 1.1** 123.



ON Technology ... 1 year MBG
 9801 **Meeting Maker (5 user)**—Plan, schedule & confirm meetings via network. Schedule a time & date, select required guests, & prepare agendas. Personal calendar to block out activities. \$309.
 9800 **Meeting Maker (10 user)** 549.

Dubl-Click Software

7974 **ClickChange 1.05** \$56.
 1824 **Calculator Construction Set 2.09.6** 62.

★ElseWare Corp. ... 30 day MBG

1507 **Bar Code Kit** 135.

★Fifth Generation ... 30 day MBG

4287 **PYRO! 4.01** 25.
 3955 **Suitcase II 1.2.10** 49.
 8286 **SuperLaserSpool 2.02** 93.
 5178 **FastBack II 2.5** 118.
 5725 **DiskLock 2.01** 118.

★FWB, Inc. ... 30 day MBG

2317 **Hard Disk Partition** 57.
 2319 **Hard Disk DeadBolt** 57.

★Go Technology ... 60 day MBG

1488 **Hot Keys Universal (word process.)** 36.

★Insight Development ... 30 day MBG

6171 **MacPrint 1.23** 93.

★JAM Software USA ... 30 day MBG

6089 **Smart Alarms w/Appl. Diary 3.07** 63.

★Kensington ... 30 day MBG

9301 **PassProof (right) or 9300 (left) ea.** 65.

★Kent Marsh Ltd. ... 30 day MBG

5457 **QuickLock 2.0** 34.
 9513 **FolderBolt 1.01** 73.
 2591 **The NightWatch 1.03** 84.
 6134 **MacSafe II 2.0** 106.

★Kiwi Software ... 60 day MBG

6267 **Kiwi Envelopes! 3.1.1** 32.

★Loop Software ... 30 day MBG

5442 **PictureBook 3.2A** 39.

★Magic Software ... 30 day MBG

7267 **AutoSave II 2.0** 26.
 7270 **Backmatic 2.0** 50.

★Microcom ... 30 day MBG

8562 **Complete Undelete 1.1** 48.
 4803 **Virex 3.2** 57.
 8561 **911 Utilities** 89.
 2462 **Citadel with Shredder** 89.

★Microseeds Pub. ... 60 day MBG

7068 **INITPicker 2.02** 34.
 2913 **Redux 1.63 49. 7116 Rival 1.1.6 49.**

★Microsoft ... 30 day MBG

4471 **QuickBasic 1.0** 64.

Multi-Ad Services

8850 **Multi-Ad Search 1.0** 115.

★Nine to Five Software ... 30 day MBG

9767 **Reports 2.0** 94.

★Now Software ... 30 day MBG

6925 **Now Utilities 3.0 (September '91)** 84.

★ON Technology ... 1 year MBG

6385 **On Location 1.02** 75.
 9801 **Meeting Maker (5) 309. 9800 (10) 549.**
 2570 **Instant Update (2) 309. 2571 (5) 619.**

★Palomar Software ... 30 day MBG

8210 **PLOTTERgeist 2.0** 249.

★Salient Software ... 30 day MBG

7404 **DiskDoubler 3.7** 49.

★Softstream ... 30 day MBG

5440 **HyperHit 3.0 119. 1568 (network) 389.**

★Solutions, Inc. ... 60 day MBG

3448 **SmartScrap & The Clipper 2.1** 56.

★SuperMac Tech. ... 60 day MBG

3377 **DiskFit 2.0** 58.



Kent Marsh Ltd. ... 30 day MBG
 A winning team! The perfect combination of hard disk and folder security. Rigorous yet elegantly simple. Full or read-only protection with a click of the mouse. And much more!
 9513 **FolderBolt** \$73. 2591 **NightWatch** \$84.

★Symantec ... 30 day MBG

5176 **Symantec AntiVirus for Mac (SAM)** 66.
 5724 **Symantec Utilities for Mac (SUM II)** 99.
 6748 **Norton Utilities for the Mac 1.1** 87.
 3421 **THINK Pascal or 3420 THINK C** 165.
 9957 **THINK Reference 1.0** 69.

★Synex ... 30 day MBG

7147 **MacEnvelope 5.02** 57.

★Tactic Software ... 30 day MBG

8964 **MasterFinder 1.2** 49.

★Teletypesetting ... 30 day MBG

8058 **TScript 1.4** 91.

★TGS Systems ... 60 day MBG

6667 **Prograph 2.5 (September '91)** 309.

★Wolfram Research ... 30 day MBG

8273 **Mathematica Enhanced 2.0 (Aug.)** 799.

★Zedcor ... 60 day MBG

3985 **ZBasic 5.0** 99.



ON Technology ... 1 year MBG
 2570 **Instant Update 1.0 (2 user)**—Create live documents that groups produce and work on together. Changes to the document from network users are saved with a click of a button. \$309.
 2571 **Instant Update 1.0 (5 user)** 619.

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To help you find out



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 TelePort A300—1990 MacUser Editors' Choice Award for Best Communications Product. 2400 bps/MNP-5 modem connects via ADB Port. SendFax (9600 baud) optional.
 8946 ⑦ Basic. \$139. 8945 with FAX. \$185.

CD-ROM

- Adobe Systems**
 8794 Adobe Type On Call CD/ATM 47.
 9443 Adobe TOC & Porta Drive Bundle 659.
- CD Technology**
 2321 CD-ROM Caddy 11. 2533 (5) 49.
 8057 Porta Drive CD-ROM 649.
 7686 Porta Drive & MS Office CD-ROM 999.
- *Discovery Systems ... 60 day MBG**
 9968 Birds of North America (CD-ROM) 26.
 9965 Sherlock Holmes on Disc (CD-ROM) 26.
 9966 Shakespeare on Disc (CD-ROM) 26.
 9967 Nautilus (subscription kit, CD-ROM) 20.
 1874 Mammals of N. America (CD-ROM) 52.
 2484 The Family Doctor (CD-ROM) 125.
- Dubl-Click**
 9944 The WetSet CD (CD-ROM) 218.
- *Everex ... 30 day MBG**
 1875 Metro CD CD-ROM Drive 649.
- *Highlighted Data ... 30 day MBG**
 7771 ⑦ Webster's Dictionary (CD-ROM) 159.
- *HyperGlott ... 30 day MBG**
 9778 ⑦ Learn to Speak English, 7473 French, or 7829 Spanish (CD-ROM) ea. 64.
 2615 Lingua ROM II (3-CD Set) 649.
- *Microsoft ... 30 day MBG**
 6382 ⑦ The Microsoft Office (CD-ROM) 599.
- *Monotype Typography ... 30 day MBG**
 Classic Font Library on CD-ROM call NEC
- NEC**
 6637 Clip-Art 3D (2500 full-color images) 246.
 6636 Image Gallery (2800 line art) 246.
 6959 Type Gallery PS (Adobe fonts) 246.
 9441 CDR36 CD-ROM Portable Drive 399.
 2478 General Reference CD-ROM Bundle (includes CDR36 kit & 3 titles) 529.
- *Penton Overseas ... 30 day MBG**
 2611 Vocabulearn/ce Spanish 1 CD 59.
 2610 Vocabulearn/ce French 1 CD 59.
- *Somak ... 30 day MBG**
 LaserArt I or II (CD-ROM) ea. 62.
- *Tactic Software ... 30 day MBG**
 2519 Tactic Multi-Media CD 149.
- Toshiba**
 6749 XM 3201 CD-ROM Drive 659.

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- *Ars Nova ... 30 day MBG**
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 2034 Voice Impact 82.
 2232 Voice Impact Pro 179.
 9975 Voice Navigator II 549.
- *Bogas Productions ... 60 day MBG**
 9279 Studio Session MIDI Utility 1.0 59.
 6135 Super Studio Session w/Music Library 99.
- Coda Music Systems**
 8188 ⑦ MusicProse 2.1 299.
 5604 ⑦ Finale 2.6.1 549.
- Computer Friends**
 8271 ⑦ ColorSnap 32 + 1.1 649.
- Electronic Arts**
 1846 Deluxe Music Construction Set 2.5 84.
- *Farallon Computing ... 30 day MBG**
 6770 MacRecorder Voice Digitizer 2.0.3 104.
 2199 MacRecorder Sound System 2.0.3 174.
 6766 MediaTracks 1.0 205.



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 1074 ⑦ System 7—Balloon help, File sharing, Publish & Subscribe, Aliasing, TrueType, Virtual memory, 32-bit addressing. Buy now & get a free PCTV® video (limit 1 per customer) with Lon Poole explaining all these new features \$99.

- Full Logic Studios**
 1163 Mac-Sound (241 sound effects) 79.
- *MacroMind ... 30 day MBG**
 9353 ⑦ MediaMaker 1.0 489.
 6159 ⑦ MacroMind Accelerator 2.01 125.
 5087 ⑦ MacroMind Director 3.0 (Aug. '91) 699.
 2246 ⑦ MacroMind Three-D 1.0 1029.
- Mass Microsystems**
 2592 QuickImage 24 579.
- *Paracomp ... 30 day MBG**
 7839 ⑦ FilmMaker 2.0.1 435.
- Passport Designs**
 8253 ⑦ TRAX 2.0.1 57.
 3117 ⑦ Master Tracks PRO 4 4.5 (Aug.) 315.
 8250 ⑦ Encore 2.0 379.
 3115 ⑦ MIDI Interface 79.
- PCTV**
 2244 System 7 Video (VHS) 9.
 2245 System 7 Video with Lon's Book 25.
- Pixar**
 1596 MacRenderMan/ShowPlace Bundle 649.
- RasterOps**
 Full line available. Partial listing.
 8526 Video Expander 499.

- 9784 RasterOps 24SI \$649.
 8944 RasterOps 24STV 1249.
- *Symmetry ... 30 day MBG**
 8172 ⑦ Mariah 1.0 93.
- *Total Systems ... 30 day MBG**
 9282 Galileo I Video (Plus) 449.
 8653 Galileo I Video (SE) 449.
- *Voyager ... 30 day MBG**
 9322 Voyager Videostack 2.0 69.
 9328 Voyager CD Audiostack 69.
 9326 Beethoven Symphony No. 9 (CD-ROM) 69.
 9327 Igor Stravinsky (CD-ROM) 69.

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- *Abracadata, Ltd. ... 30 day MBG**
 9995 ⑦ Instant Decorator 29.
 9990 ⑦ Design Your Home - Architecture, 9992 Interiors or 9994 Landscape ea. 63. Libraries available. call
- Accolade**
 1423 Hard Ball II 31.
 8220 Jack Nicklaus Golf 34.
- *Aldus ... 30 day MBG**
 3503 Dark Castle or 3502 Beyond DC ea. 36.
- *Baseline Publishing ... 30 day MBG**
 7785 ⑦ Talking Moose 23.
- *Beacon Technology ... 30 day MBG**
 ⑦ HyperBible 2.03 (KJ or NJ) ea. 125.
- Broderbund Software**
 4314 ⑦ Type! 1.0 18.
 6516 The Playroom 1.1 (CP) 29.
 Carmen Sandiego Series (CP) ea. 29.
 6384 ⑦ PlayMaker Football 1.1.1 29.
 9804 RoboSport or 8195 ⑦ BannerMania 35.
 8266 SimEarth 1.0 40.
 4966 SimCity 1.2 (CP) 29.
 5871 SimCity Supreme 1.2C 47.
- *Carina Software ... 30 day MBG**
 5726 Voyager 1.2 87.
- *Casady & Greene ... 60 day MBG**
 2268 ⑦ Crystal Quest 2.2x, 7495 ⑦ Mission Starlight or 7498 ⑦ Sky Shadow ea. 29.
- *Centron Software ... 30 day MBG**
 8525 ⑦ Casino Master 3.24 (B&W) 41.
 8524 ⑦ Casino Master 4.1 (Color) 45.



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 7482 ⑦ RightWriter for the Mac 3.1—Instantly improve your writing. RightWriter for the Mac makes it simple. With a few clicks of the mouse, RightWriter checks your grammar, style, word usage and punctuation \$54.

what it's all about

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- 6128 Math Blaster Mystery 1.0 (CP) ... \$29.
8050 ⑦ EARTHQUEST 2.0 ... 48.

Electronic Arts

- 6716 Pipe Dreams 1.2 ... 17.
8643 Harpoon ... 39.
1907 ⑦ PGA Golf (August '91) ... 39.

FTL/Software Heaven

- 1555 ⑦ OIDS ... 25.

★ Great Wave ... 30 day MBG

- 2276 ⑦ KidsTime or 5642 ⑦ KidsMath ea. 26.
4334 ⑦ NumberMaze 26. 8527 (Color) 36.
8044 ⑦ NM Decimals & Fractions (Color) 36.
1517 ⑦ ReadingMaze. 26. 1513 (Color) 36.

★ HyperGlot Software ... 30 day MBG

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⑦ Pronunciation Tutor - Beginner (Span., Fren.) ea. 35. (Germ., Chin.) 39.
⑦ Verb Tutor - Intermediate (Spanish, French, German) ... ea. 39.
⑦ Survival Manuals (var. langs.) ea. 39.
6611 ⑦ Kanjmaster - Beg. (Japanese) ... 99.



Nordic Software ... 30 day MBG

8257 Preschool Pack - Color 1.0—Teaches children their A, B, C's and 1, 2, 3's in a light and enthusiastic manner using color animation, graphics and sound. Six different modules on 3 disks ... \$35.

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- 1562 ⑦ 3 in Three 1.1 (August '91) ... 31.
8809 ⑦ Tesserae or 7622 Darwin's Dilemma 31.
1944 ⑦ Swamp Gas ... 31.

Interplay Productions

- 1894 BattleChess (3D animation) ... 29.
1893 CheckMate (infinite play levels) ... 31.

★ Learning Company ... 30 day MBG

- 2670 ⑦ Reader Rabbit 3.0 (CP) (ages 4-7) 30.

★ Leister Productions ... 30 day MBG

- 7126 ⑦ Reunion 2.0 ... 109.

Microprose

- 2008 ⑦ Railroad Tycoon ... 40.

★ Microsoft ... 30 day MBG

- 2868 Flight Simulator 1.02 (CP) ... 33.

★ Nordic Software ... 30 day MBG

- 8260 Word Quest 1.0 ... 30.
8257 PreSchool Pack - Color 1.0 ... 35.



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Sierra On-line

- 9733 Hoyle's Book of Games II ... 23.
7367 Space Quest III (color reqs. 2 MB) ... 35.

Sir-Tech Software

- 8229 ⑦ Bane of the Cosmic Forge ... 35.
8228 Wizardry II: Knight of Diamonds (CP) 28.

Software Toolworks

- 4619 ⑦ Mavis Beacon Typing 1.3 (CP) ... 32.
1908 ⑦ World Atlas or 1910 U.S. Atlas ea. 52.



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8180 Faces 1.0 ... 25.
3459 Falcon 2.2.1 or 8181 ⑦ Vette 1.0 ea. 33.

★ Spinnaker ... 30 day MBG

- 2328 Sargon IV 1.03 (CP) (chess) ... 28.

★ Strategic Studies ... 30 day MBG

- 8085 Panzer Battles ... 26.
8084 Halls of Montezuma ... 26.

StudyWare

- ACT, GMAT, GRE, or SAT Prep ea. 29.
8098 LSAT Prep for the Mac 2.5 ... 35.

★ Terrace Software ... 30 day MBG

- 8192 ⑦ Mum's The Word 1.0 (gardening) 79.

★ Toyogo ... 30 day MBG

- 1993 ⑦ Nemesis Scribbler ... 31.
7624 ⑦ Nemesis Go Master 5.0 (August '91) 36.
2471 ⑦ Nemesis Deluxe Toolkit ... 72.

★ XOR ... 30 day MBG

- 6040 MacGolf Classic 1.0 (CP) ... 52.



Prometheus ... 30 day MBG

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Applied Engineering

- 8363 ⑦ DataLink/Mac Portable ... 209.
8362 ⑦ QuadraLink 1.1.1 ... 205.

★ Beagle Bros. ... 30 day MBG

- 7691 ⑦ Flash 1.2 ... 125.

★ CE Software ... 60 day MBG

- 5174 ⑦ QuickMail 2.5 (5) 249. 5173 (10) 375.

★ CompuServe ... 60 day MBG

- 1676 ⑦ Macintosh Membership Kit 1.03 ... 22.
1673 ⑦ CompuServe Navigator 3.04 ... 49.
1674 ⑦ Membership Kit/Navigator Bundle 68.

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- 1823 ⑦ MacLink Plus/PC 5.0 ... 129.
4842 ⑦ MacLink Plus/Translators 5.0 ... 109.

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8719 EtherPrint or 9888 (10 Base T) ea. 349.

Dove Computer

6758 DoveFax Desktop 1.1.1 295.
9634 DoveFax+ 1.1.1 359.

EveryWare

8077 AllShare 1.1.4 139.

★Farallon Computing ... 30 day MBG

9805 ⑦Timbuktu 4.0 135.
4866 ⑦Timbuktu/Remote 2.0.1 135.
8707 Liaison 3.0.2 279.
9960 PhoneNET Talk 135.
9961 PhoneNET Card PC 209.
6273 PhoneNET StarConnector 10-Pack. 129.
4869 PhoneNET Connector 10-Pk (DIN8) 198.
2206 PhoneNET StarController 300 899.
6687 PhoneNET StarController-EN 500 1739.

★Freesoft ... 60 day MBG

6115 ⑦White Knight 11 85.

★Global Village ... 30 day MBG

8946 ⑦TelePort A300 139.
8945 TelePort/FAX 185.

Hayes

2300 ⑦Smartcom II 3.2A 84.
8614 Personal Modem 2400 Plus 149.
7391 Ultra 9600 Modem 669.

★Insight Development ... 30 day MBG

1296 ⑦Mosaic 1.0 (3). 249. 1295 (10). 375.

Insignia Solutions

7557 ⑦Access PC 1.1 62.
7058 ⑦SoftPC-AT/EGA Module 1.4 124.
9726 ⑦SoftPC 2.0 (Classic, LC, SE, Port.) 135.
4089 ⑦SoftPC 1.3 245.

Intel Corporation

5119 2400EX Modem 179.
6420 2400EX MNP Modem 229.

★Int'l Business Software ... 30 day MBG

8581 DataClub (3) 199. 8580 (10) 539.

★Kennet Tech. ... 30 day MBG

5631 ⑦Rapport 1.3.6 195.
7588 Drive 360 or 7590 Drive 1200. ea. 249.
5632 Drive 2.4 (3 1/2") (incl. FastBack II) 325.

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8027 MacModem V.32 689.

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8994 2400 V.42 bis Modem 209.
7934 PM9600SA Modem 1.26 489.
9849 SmartPack 9600 529.

★Prometheus ... 30 day MBG

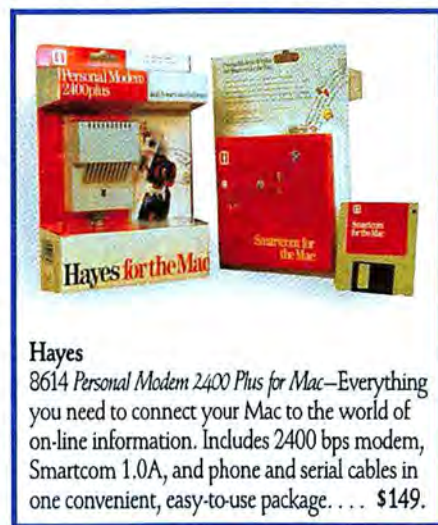
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8738 ProModem 9600M Plus 599.
8990 ProModem Ultima 689.

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4347 NetBridge or 4942 ⑦TeleBridge 409.
3443 ⑦NetModem V2400 339.
8189 FastPath V 1889.

Sitka/TOPS

4188 Teleconnector (DIN8) 23. 2230 (10) 189.
3720 TOPS Flashcard 155.
6264 ⑦TOPS Network 3.1 (August '91) 187.



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8614 Personal Modem 2400 Plus for Mac—Everything you need to connect your Mac to the world of on-line information. Includes 2400 bps modem, Smartcom 1.0A, and phone and serial cables in one convenient, easy-to-use package. \$149.

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3455 ⑦MicroPhone II 3.0 215.

★Solutions, Inc. ... 60 day MBG

6720 ⑦FAXGATE Plus 3.0 239.

★Symmetry ... 30 day MBG

9969 EasyShare 1.2.1 69.

★Synergy ... 30 day MBG

6618 ⑦VersaTerm 4.5 90. 6619 PRO 3.5 177.

★Zoom Telephonics ... 30 day MBG

1168 MX2400R Modem (w/QuickLink II) 85.
1176 MX2400S Modem (w/SendFax 9600) 95.
2310 Fax/Modem FX9624 139.
1179 V.42bis Modem (w/MacPack) 169.
2311 V.32 Turbo Modem (w/MacPack) 439.

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7432 ⑦Scan 300/GS (reqs. Scan Kit) 999.
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1496 Int. Kit for 300/Color w/Photoshop 479.
1537 LaserScript LX 1729.

ACME/Safe Power Systems

1948 Safe 300 (power backup) 199.

★Advanced Gravis ... 30 day MBG

9963 Gravis Mouse Stick 59.
9964 Gravis Super Mouse 84.

American Power

5895 UPS 110SE 209.
6686 UPS 370ci 339.

Applied Engineering

9799 ⑦Cache-In 199.

Bravo Communications

9813 2 Pos. Laser (compatible switch box) 95.
9817 4 Pos. Laser (compatible switch box) 119.

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8124 ⑦Typist 1.1 479.
4476 ⑦OmniPage 2.12 495.

★CoStar Corp. ... 30 day MBG

1884 LabelWriter II (September '91) 193.
1880 LabelWriter II Plus (September '91) 299.
1418 AddressWriter (September '91) 469.
1885 ⑦Stingray ADB (August '91) 89.

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★Datadesk ... 30 day MBG

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2384 MAC101E Kybrd. with QuickKeys² 149.
6901 Switchboard (modular keyboard) 159.

★Everex ... 30 day MBG

1144 ⑦Silhouette Trackball 82.

GDT Software

6256 ⑦PrintLink Collection 4.01 59.
7687 ⑦Mac Daisy Link 1.1.7 59.
6151 ⑦JetLink Express 2.1 89.
8960 ParaLink Express 99.

Hewlett-Packard

6514 HP DeskWriter (incl. cartridge) 569.
9993 HP LaserJet IIIP (with toner) 1149.
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Hitachi

9492 14" Color Monitor (w/Mac II adaptor) 599.

★Kensington ... 30 day MBG

⑦Turbo Mouse 3.0 (Plus or ADB) 107.

Kraft Systems

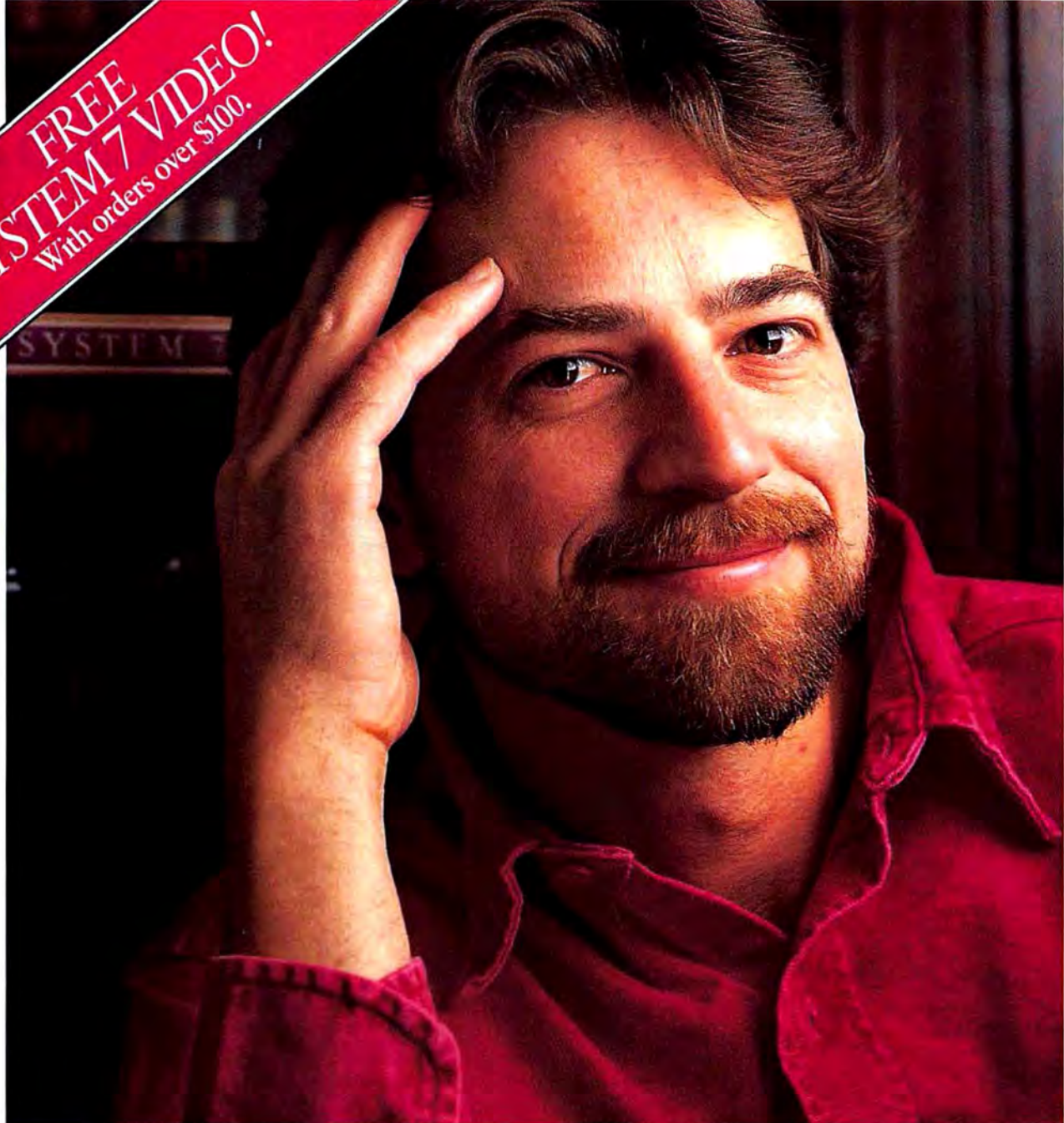
7519 KM30 ADB Joystick 42.



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If you've been trying to figure out what System 7 can do for you, this is a great way to find out. And it's *free to anyone who places an order over \$100*. (Limit one per customer.) Or you can buy a copy for \$9.

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- 4811 Transparencies 8 1/2" x 11" (Qty. 50) . 22.
4807 Laser Labels 1" x 2 5/8" (Qty. 3000) . 24.
5392 Disk Labels 3 1/2"-Laser (Qty. 630) . 29.
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- 7453 The Organizer Jr. 82.
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8973 Apple Security Kit (SL-2) 22.
8046 MVP Mouse (MVP-1) 89.

Ergotron

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9979 MacTilt II (high resolution) 75.

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8374 The Macintosh Bible (with disks) . 25.

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- 2238 Macworld Guide to System 7 19.

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2573 Tilt/Swivel (platinum) 24.
2559 Apple Security Kit 33.
9303 Keyboard Shelf 39.
2010 MacClassic Anti-Glare Filter 45.
6763 SE Radiation/Anti-Glare Filter . . 52.
5064 Apple Color Monitor Polarizing Filter 63.

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1505 Oak Disk Case (36) . 21. 4623 (90) . 32.
8795 Switch Box (2 Pos.) . 32. 8796 (4 Pos.) 49.

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- 4470 Fanny Mac QT (Platinum) 53.

★Moustrak ... 60 day MBG

- 2694 Moustrak Pad (7"x9") 8. 2692 (9"x11") 9.
2693 Moustrak Pad Low Friction (9" x 11") . 10.
Mouse Glove (various colors) . . . ea. 9.

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- 3255 ImageWriter II Black Ribbon 4.
3267 (6 Pak) . . 18. 9362 (12 Pak) . . . 29.
3261 Image II Multi-4-Color . 9. 9810 (6 Pak) 39.
3270 Image II Rainbow Pak (6 colors) . . 18.

★Sopris Softworks ... 60 day MBG

- Ripstop Nylon Dust Covers call.
2009 Mac Classic Economy Case 49.
4014 High Trek Mac SE & Ext. Kybd. Case 69.



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4900 Lappac 2 Deluxe (for Mac Portable) . 55.
3617 Mac Classic/Plus/SE Case 59.
4015 Mac SE & Ext. Kybd. Carry Case . . 75.

★Tripp Lite ... 30 day MBG

- 6199 Isobar 4 (surge suppressor, 4 outlets) 49.
6200 Isobar 6 (surge suppressor, 6 outlets) 59.

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★Fuji ... 60 day MBG

- 2214 3 1/2" DS Disks (10) . 11. 2242 (50) . 49.
2215 3 1/2" HD Disks (10) . 18. 2241 (50) . 79.
2243 3 1/2" DS Disks Color (10) 12.
2239 3 1/2" HD Disks Color (10) 19.

★MacConnection ... 60 day MBG

- 6592 44 MB Cartridge . 74. 9728 (10) . 699.

★Sony ... 60 day MBG

- 3297 3 1/2" DS Disks (10) . 11. 6148 (30) . 29.
3298 3 1/2" HD Disks (10) . 18. 6375 (30) . 49.
8185 QD2040 Tape Cartridge 19.
1603 DG60M (DDS 4mm, certified 1.3GB) . 18.
2520 DG90M (DDS 4mm, certified 2GB) . . 28.

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5082	ScanMan Model 32 G-Scale Scanner	299.

★MicroSpeed ... 30 day MBG

6620	MacTRAC (for 512, 512E & Plus)	62.
6621	MacTRAC ADB (for SE & II family)	75.

★Microtek ... 30 day MBG

1981	MS-II OCR Scanner	849.
1978	Scanmaker 600GS	1199.
1985	Scanmaker 600ZS	1599.
1982	Scanmaker 1850S	2299.

Monster Design Group

1486	MacSpeakers (two, stereo)	175.
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★Mouse Systems ... 30 day MBG

7560	Trackball ADB	68.
	Little Mouse or Little Mouse Plus	ea. 74.
9471	A3 Mouse	85.

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	19" for SE, SE/30, II, IIsi	ea. 995.
	19" for GrayScale SE/30, II, IIsi	ea. 1295.
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6229	7 Grappler LX	134.



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★Cutting Edge ... 30 day MBG

3989	800K External Disk Drive	special 119.
5456	44 MB Removable Drive	599.
3990	30+ MB Hard Drive	359.
3991	45+ MB Hard Drive	379.
5275	60+ MB Hard Drive	399.
5276	80+ MB Hard Drive	469.
1213	52 MB Hard Drive (Quantum)	439.
1569	105 MB Hard Drive (Quantum)	649.
1573	185 MB Hard Drive	899.
1217	601 MB Hard Drive	2229.

★Dayna ... 60 day MBG

8723	DaynaFile II 360k Drive	449.
8722	DaynaFile II 1.2 5 1/4" Drive	449.
8724	DaynaFile II Dual 360k & 1.44 MB	739.

★DayStar Digital ... 30 day MBG

Listed items do not include coprocessor.		
	LT200 Connection (PC)	189. (MC) 299.
8556	FastCache for Mac IIsi	279.
	25 MHz PowerCache 030 for SE/30, II, IIs, IIsx, LC	749.
	40 MHz PowerCache 030 for SE/30, II, IIs, IIsx, IIsi, LC	949.
	50 MHz PowerCache 030 for SE/30, II, IIs, IIsx, IIsi, LC	1689.



Applied Engineering

2532 QuickSilver Accelerator for the IIsi—Gives your Mac IIsi speed and expandability with an SE/30 slot extender, a cache card and a 68882 math coprocessor chip on board. Comes with a 5 year warranty. \$309.

1970	Ram PowerCard (reqs. memory)	\$749.
8583	SCSI PowerCard (reqs. memory)	1095.

★Fifth Generation ... 30 day MBG

9403	JukeBox Five (auto disk feeder)	155.
9809	FastBack Tape	999.

★FWB, Inc. ... 30 day MBG

2320	HammerDisk44 (removable)	759.
2331	PocketHammer50	599.
2329	PocketHammer100	899.
2314	PocketHammer200	1349.
2341	Hammer50is (internal)	469.
2333	Hammer100is (internal)	699.
2334	Hammer200is (internal)	1199.

lomega

7551	44 MB Transportable (reqs. kit)	call
2224	90 MB Transportable (reqs. kit)	799.
2467	Gold Std. Rem. Disk (90 MB, tri-pak)	439.

Mass Microsystems

2605	DataPak (45 MB removable)	699.
2599	DataPak 88 Classic	call

★Micron ... 30 day MBG

7149	Xceed IIsi-128K Cache Card	239.
6680	Xceed for SE/30 (640 x 480)	279.
2262	Xceed Color 30 Card (SE/30)	279.
2263	Xceed MacroColor II Card (Mac II)	469.



Sigma Designs

1501 DoubleUp—Compress data, image and application files. Hardware compression accelerator. Includes best selling DiskDoublers 3.7 software. For Mac NuBus computers. Rated fastest by MacWEEK. \$185.

Peripheral Land, Inc. (PLI)

8335	PLI TurboFloppy 1.4	309.
8333	PLI Sony 40 Turbo Ext. Drive	419.
8334	PLI SuperFloppy	449.
8327	PLI Infinity 40 Turbo	699.
9752	PLI Infinity 88 Turbo	999.
9862	PLI Infinity 40 Twin	1199.
8330	PLI 105 MB Ext. Drive	699.
8329	PLI 200 MB Ext. Drive	1159.
2327	PLI 2GB DAT Drive	2059.
1866	Quick SCSI Card	319.

Sigma Designs

1501	DoubleUp	185.
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★Total Systems ... 30 day MBG

8989	High Speed SCSI for Mercury 16+	209.
7817	16 MHz Mercury 030 (for Mac SE)	359.
8624	16 MHz Mercury 030 (for Mac Plus)	489.
7816	20 MHz Gemini 030	799.
8708	25 MHz Gemini 030	1089.
7814	33 MHz Gemini II 030	1375.
8371	40 MHz Gemini II 030	1499.
	20-40 MHz Gemini Classic	call
	68882 Math Coprocessors	call

Datadesk ... 30 day MBG

9830 MAC101E Keyboard—Latest version featuring function keys, click-click tactile sensation, six separate screen control keys, a numeric keypad and isolated Esc and Reset keys. \$129.
2384 MAC101E Keyboard with QuickKeys². \$149.

★Pacific Data ... 60 day MBG

7412	7 Pacific Page (PE)	529.
	1473 (XL)	979.

★Sophisticated Circuits ... 30 day MBG

8009	7 PowerKey 1.01	64.
8008	PowerKey Remote	32.

TheComplete PC

6104	Half-Page Scanner/400	289.
	Thunderware	
4994	LightningScan 400	385.

UPGRADES & DRIVES

MEMORY, ACCELERATORS

SIMMs ... with free video

1107	1 MB SIMMs (80ns)	49.
8316	1 MB SIMMs (80ns, set of 2)	95.
9437	2 MB SIMMs for IIsi or II LC	129.

Applied Engineering

1971	FastMath LC	139.
8361	7 1.44 MB High Density Drive	229.
2532	QuickSilver (32K cache card)	309.
	MacRam Classic with 0, 1, or 3 MB	call

Designing the Future... MicroStation

From the world's leading supplier of computer-aided design solutions comes MicroStation, the first production CAD package for the Apple Macintosh.

MicroStation is a powerful 2D/3D CAD system incorporating a full implementation of the Macintosh user interface to give you the standard look and feel of Macintosh software. Easy to learn and easy to use.

MicroStation lets you share common data simultaneously within a network of PCs, Macintoshes, and UNIX workstations.

MicroStation offers a wide range of third-party applications and a sophisticated platform for developing your own applications.

When productivity is a requirement, let MicroStation give you the advantage — power, sophistication, and ease of use, plus worldwide product support. The promise of the future... today!

For a free MicroStation Mac demo or further information on MicroStation and related products: in the U.S., call 800-345-4856; in Alabama only, call 800-345-0218; in Canada, call 416-625-2081; in other countries outside the U.S., contact an Intergraph sales office.

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Please circle 147 on reader service card.



NEW ON THE MENU

Junk-mail redux: Some months ago, Lotus canceled Lotus MarketPlace, a mailing-list CD-ROM, amid a fire storm of controversy over privacy. But like a soap-opera character, the idea didn't really die. Some of Lotus' former managers have formed MarketPlace Information ([617] 225-7850) and have shipped MarketPlace Business, a business-to-business CD-ROM that Lotus had planned to distribute before it bailed out. Junk mail always gets through.

By Russell Ito

Video season: Mac-video vendors got a big jump on the networks and debuted their new releases months before the fall TV season. RasterOps ([408] 562-4200) got things started with six new cards. The 8/24XLi is an accelerated card that's available in two versions — 8-bit (\$2,499) or 24-bit (\$4,499). The 8XL (\$999) is an 8-bit entry-level card, and the ClearVue/GSXL (\$999) is an 8-bit gray-scale unit. All four cards can drive displays as large as 21 inches. And for multimedia watchers, RasterOps now offers the 24XLTV (\$4,999) and the 24STV (\$1,799). Each is a 24-bit card that can render full-motion video in a window. The 24XLTV supports displays as large as 21 inches and is accelerated; the 24STV is intended for a standard Apple 13-inch RGB monitor. SuperMac Technology ([408] 245-



2202) has announced two cards of its own: the 8-bit Thunder/8 (\$1,899) and the 24-bit Thunder/24 (\$4,999). Both cards are accelerated and can drive 21-inch displays. The PrecisionColor 8 Interface (\$795), from Radius ([408] 434-1010), is an 8-bit model that can drive displays as large as 21 inches from a variety

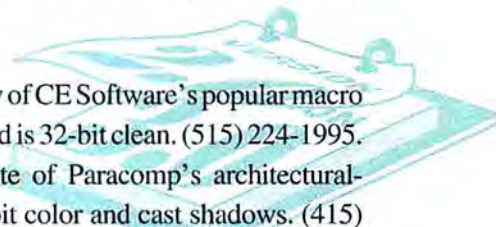


of manufacturers, including PC VGA and SVGA monitors. Micron Technology ([800] 642-7661) has also introduced three budget cards: one for NuBus machines and two for the SE/30. The XCEED MacroColor II (\$569) is a 24-

bit card designed for 640-x-480-pixel displays. The XCEED Color 30 (\$339) is an SE/30 PDS card that can render 8-bit color or gray scale on 640-x-480- and 640-x-870-pixel displays. The XCEED Gray-Scale 30 (\$89) is a video adapter card for the SE/30 that, when it's installed in conjunction with the Color 30, turns the SE/30's internal display into an 8-bit gray-scale display. Finally, Lapis Technologies ([415] 748-1600) has introduced the DisplayServer LC (\$449), a 1-bit card that lets you drive a full-page display with an LC, and the DisplayServer Classic (\$349), which lets you do the same with a Classic. The Mac video season is in full swing. Maybe the Fox network had the right idea after all.

Up to Date . . .

Version 2.1 of QuicKeys 2 is the System 7 rev of CE Software's popular macro program. Version 2.1 supports Apple events and is 32-bit clean. (515) 224-1995. \$149. ModelShop II is a complete rewrite of Paracomp's architectural-modeling package. New features include 24-bit color and cast shadows. (415) 956-4091. \$895. SuperCard, Aldus' meta-HyperCard, has been revved to version 1.6. Aldus' System 7 revision supports balloon help and Apple events and can convert HyperTalk scripts to SuperTalk. (619) 695-6956. \$299.





RasterOps' Espresso Personal Slide Scanner is a budget slide scanner that works with a frame-capture card and bears an uncanny resemblance to a coffee machine.

Images Expresso

Color input is something a lot of people want, whether they're working on presentations or simple page layouts. Unfortunately, the cost of most slide scanners keeps the machines out of many users' hands. RasterOps, however, has now introduced the affordable Espresso Personal Slide Scanner.

At a little less than \$1,000, the Espresso, which gets its name from its remarkable resemblance to an espresso machine, provides NTSC-video output that can be digitized with a frame-capture card. Any video card or frame grabber that can accept video input can work with the Espresso. To use the Espresso, all users have to do is position a 35mm slide in the unit's slide carrier and then focus and frame the image as desired. The Espresso offers a 3x zoom lens and manually variable controls over focus, brightness, color saturation, and hue and balance. Users can also scan positive or negative images.

Although the image quality isn't going to put high-end slide scanners such as those from Barneyscan and Nikon out of business, users looking for a budget color-input solution may find the Espresso the perfect cup of pixels.

RasterOps Corp., 2500 Walsh Avenue, Santa Clara, CA 95051; (408) 562-4200. \$999.

The Information Spreadsheet

A big part of personal computing is being able to pick the right tool for the task, which often means using outlining, word-processing, spreadsheet, scheduling, and database applications to do a single job. Unfortunately, it also often means that you have to duplicate a lot of information, and updating changing conditions among the various applications is a major hassle. With this in mind, Chena Software has introduced Fair Witness, a slick package that combines the essential functions of all those tools in one application.

Fair Witness starts as an outliner, in which users enter ideas in any order. Reordering ideas and establishing dependencies is a matter of clicking and dragging. The package also offers a fast way of grouping ideas: You can just drag an entry over a collection of icons at the bottom of the screen, so there's no unnecessary scrolling. You can then expand the outline into what the developer calls an information chart, essentially a spreadsheet grid into which you can enter dates and notes, assign tasks, establish priorities, and even add sounds. Columns can be rearranged by dragging, and rows and columns can be hidden or revealed as necessary. You can also save multiple views of a single document, so you can access them quickly.

Once you've entered dates into the information chart, Fair Witness can generate a schedule chart automatically. You can then modify the schedule by dragging the bars around, and the new dates will automatically update in the information chart.

Fair Witness offers a high level of integration and simplicity. For example, you can enter mathematical formulas by using

standard English words, such as *Sum* and *Average*, and the package automatically performs the operation — you don't have to enter a cell range. Users used to juggling applications to manage their information may find Fair Witness a good deal more than fair.

Chena Software, 905 Harrison Street, Allentown, PA 18103; (800) 245-4577. \$495.



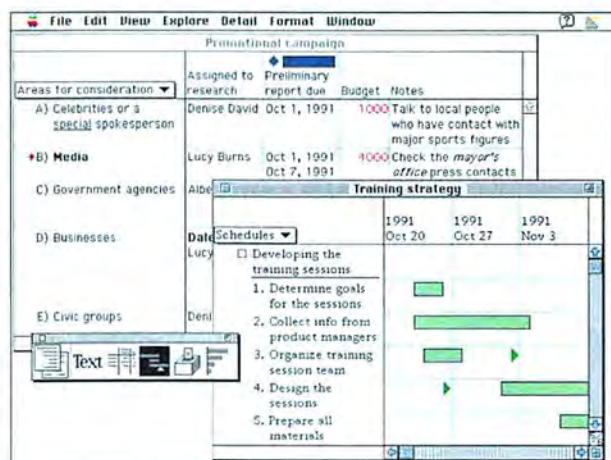
Omega's Bernoulli 90 has more than double the capacity of previous Bernoulli drives while boasting as much as 66 percent faster data throughput.

Bernoulli Turns 90

Following the trend toward higher-capacity removable media, Omega has announced a 90-megabyte version of its Bernoulli drive, more than double the capacity of its predecessor.

In addition, the new unit boasts data-transfer rates as much as 66 percent faster than those of the previous model. It also uses an automatic head-cleaning function that eliminates the necessity for periodic cleaning of the drive. The Bernoulli 90 can read earlier 44-megabyte disks, but it can't write to that format.

Omega Corp., 1821 W. 4000 South, Roy, UT 84067; (801) 778-1000. Transportable, \$1,149; dual, \$2,249.



Fair Witness is a unique package that lets you start with an outline that can be expanded into an information spreadsheet that can then produce a schedule chart.

NewsLine

Reports and Analysis

Apple and IBM Team Up

SAN JOSE, CA — Completing an agreement that would have been anathema only a few years ago, Apple Computer and IBM have announced the signing of a letter of intent to develop and market new technologies that will be used across a variety of computer platforms.

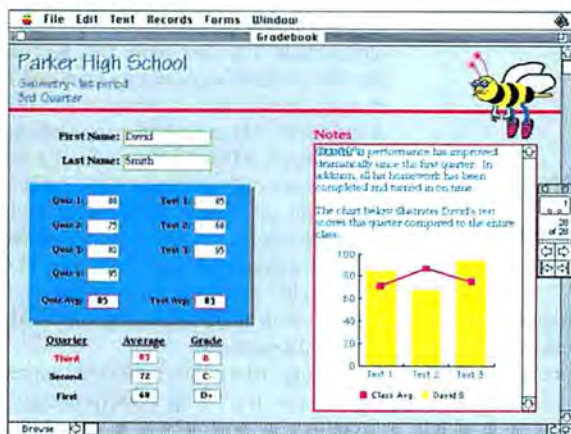
One of the key elements in the agreement is the formation of a jointly owned and independently managed software company that will develop and market an object-oriented operating system capable of running on everything from an Intel x86-based machine to a Motorola 68000-family unit (such as a Mac) to an IBM RISC System/6000. The intent is to design the OS so that applications currently written to run under AIX (IBM's version of UNIX), OS/2, and Mac operating systems will run normally. Apple has been developing such a cross-platform operating system, code-named Pink, for some time, and some analysts have predicted that the new partnership will slow the project considerably.

Apple and IBM will also develop, market, and support networking and communications products for integrating the Mac into IBM's client/server enterprise environments. As part of this effort, the companies will develop an enhanced version of AIX that will run on a range of computers from desktop workstations to servers while offering both Macintosh and OSF/Motif user interfaces. In a published report, Roger Heinen, Apple's vice president and general manager for Mac software, said that Apple would have a version of the Mac operating system that would work with both the RS/6000 and Motorola's 68000-family microprocessors before Pink was finished. Some reports indicate that Apple may produce a RISC-based Mac as early as next year.

Apple will also adopt IBM's RS/6000 POWER architecture, called POWER PC, for future Macs. Motorola will work with IBM to design and manufacture the new chips, which Motorola will also sell to other manufacturers.

Finally, the companies have agreed to work together to develop platform-independent multimedia technologies. The first products from the venture are expected to reach the market in two to three years.

Symantec's GreatWorks is an eight-in-one integrated package that includes word-processing, spreadsheet, chart-generating, painting, drawing, database, and telecommunications modules.



The 600-dpi Desktop Printer

With user needs becoming more specialized, 300-dpi laser-printer resolution is no longer enough for many users. QMS has responded with two models that have double the standard laser-printer resolution — 600 x 600 dpi — but that aren't double the price.

The QMS-PS 815 MR and 825 MR are PostScript multiple-resolution (300 x 300 dpi or 600 x 600 dpi) models that offer many of the features users have come to expect from QMS, such as automatic emulation switching for mixed printing environments. Users can set the resolution through either software or the printers' front panels. QMS offers switchable resolutions because the company estimates that printing at the higher resolution can take as much as 25 percent longer.

A 20-megahertz 68020 chip drives each printer, and QMS includes 45 resident Adobe typefaces. This is ten more than the standard set and includes four typefaces from the Helvetica Condensed family and six from the Adobe Garamond family. The printers are identical except for their paper trays. The 815 MR offers a single 200-sheet letter-sized-paper cassette,

whereas the 825 MR offers two 200-sheet cassettes.

QMS, Inc., One Magnum Pass, Mobile, AL 36618; (800) 631-2692. QMS-PS 815 MR, \$5,495; QMS-PS 825 MR, \$6,495.

GreatWorks: Eight in One

Firing the first shot in what promises to be an integrated-application war, Symantec has launched GreatWorks, a package with eight integrated application modules: a word processor, database manager, spreadsheet program, chart generator, drawing program, painting program, outliner, and communications program.

Tasks such as text formatting, file translation, and using a ruler are the same in every module. Symantec calls features common to all eight modules CORE Technologies. GreatWorks also supports XTND file translators, so sharing and importing data aren't problems.

Each of the application modules has a feature set similar to that of a stand-alone application. The word processor, for example, supports multiple-column documents, custom font styles, and mail-merge (in conjunction with the database manager). The spreadsheet program offers worksheet dimensions of 256 columns by 16,384 rows, with more than 100 predefined functions. The drawing module supports 8-bit color, whereas the painting module is monochrome only.

Integrated packages should prove attractive to buyers on a budget, and with GreatWorks getting things started, buyers should soon have a wide variety to choose from.

Symantec Corp., 10201 Torre Avenue, Cupertino, CA 95014; (800) 441-7234. \$299.



The QMS-PS 815 MR and 825 MR are reasonably priced, 8-page-per-minute PostScript printers that can print at a resolution of either 300 x 300 dpi or 600 x 600 dpi.

HARDWARE & ACCESSORIES

Radius Rocket

CPU-intensive applications really take off with the new Radius Rocket 68040 accelerator for NuBus machines.

No matter how much memory and horsepower you pump into your Mac, the machine is still hard-pressed to meet the demands of certain processor-intensive applications. If you're working with multimegabyte 24-bit graphic images, book-sized desktop-published documents, and multithousand-cell spreadsheets, Mac CPU performance is often a

bottleneck. Fortunately, Radius has come up with a bottleneck breaker called the Rocket. The 68040-equipped NuBus accelerator, designed for Mac IIs, IIfx's, IIfx's, and IIfx's, is capable of quenching the CPU thirst of the most-demanding applications.

Lift-off

For close to the same price as Apple's Mac IIfx Logic Board Upgrade kit for the Mac II and IIfx, the \$3,495 Rocket achieves a performance level that's unmatched by any other accelerator tested by MacUser Labs. Although the Rocket is clearly aimed at users who are considering Apple's upgrade, the product also boosts the performance of Mac IIfx's and Mac IIfx's. Mac IIfx owners who are looking for an accelerator should look elsewhere, because the Rocket doesn't work with the IIfx. The Rocket also doesn't work with the Mac II A/UX configuration.

The Radius Rocket is a technological tour de force comprising a single NuBus card equipped with a 25-megahertz Motorola MC68040 processor, sophisticated memory-cache features, and a massive heat sink. In addition, the board sports eight sockets that can accommodate as much as 128 megabytes' worth of SIMMs. That's Mac II-compatible memory, not Mac IIfx-compatible memory, so Rocket users don't have to invest in new RAM, unlike those who are upgrading their machines with Apple's Mac IIfx upgrade. By having the CPU and the memory on the card, the Rocket minimizes the data-throughput reduction that occurs when a traditional Mac's CPU communicates with its memory and other NuBus cards.

Rocket memory that the Mac's system software doesn't use can be configured into a RAM disk with a program such as Connectix's Maxima 2.0 to provide the speedy processor with a disk drive that won't slow it down.

In addition to sporting the fastest Mac-compatible processor, the Radius Rocket contains a built-in QuickDraw accelerator

that permits high-performance NuBus block-mode transfer with the Radius DirectColor/24 video-display card and a Radius QuickCAD accelerator for use with QuickCAD-compatible applications such as AutoCAD and Vellum. The Rocket provides not only increased CPU performance but also faster video output, both of which represent critical performance hurdles for high-end Mac computing. The Rocket also performs block-mode data transfers with block-mode-capable SCSI-2 disk-adaptor cards.

Looking to the future, the Rocket comes equipped with a 32-bit PDS (processor-direct slot) that will allow special-function daughterboards — such as disk controllers, high-performance video interfaces, or JPEG-compatible image-compression boards — to be plugged directly in to it.

Not surprisingly, the Rocket consumes a lot of NuBus power: It's rated at 4.5 amps at 5 volts with 8 megabytes of RAM. Although this shouldn't be a problem in Macs that have a single additional card, the Rocket's power requirement is about double the Apple-defined maximum for a single card. This may pose problems in systems that are equipped with multiple cards.

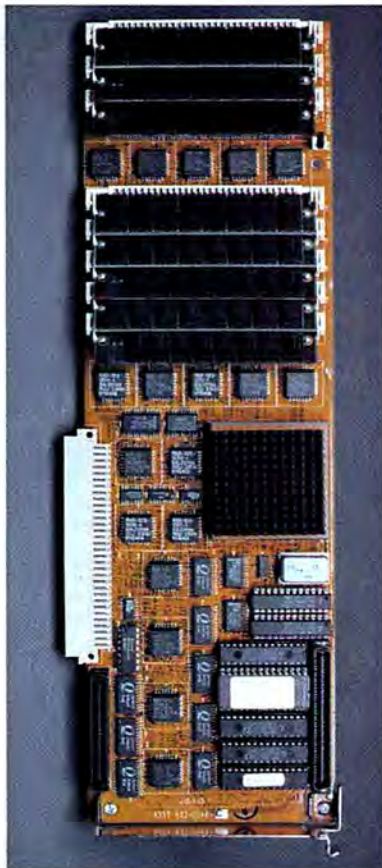
Installing the Radius Rocket is simple: Insert the card into an empty slot, and install the Radius Rocket software, which can include as many as seven INITs, depending on the configuration. You turn the Rocket on and off via a control panel.

In addition to QuickCAD and the Radius Math INIT (which sends mathematical calculations to the Rocket's built-in FPU), the Rocket comes with three networking INITs that let it communicate with LocalTalk/EtherTalk devices.

The Rocket functions in either 68030 or 68040 mode, based on the setting of the Cache Mode switch in the RadiusWare control panel. Radius claims that Rocket users can boost application performance by 10 to 20 percent, using 68040 mode versus 68030 mode with software written to take advantage of the 68040 cache. Radius also ships the Rocket with default 68030 settings for more than 70 popular programs. Users can add other programs and set the cache mode accordingly.

Rocket Thrust

From a subjective point of view, life with the Rocket is nothing short of wonderful: Excel recalculations on huge spreadsheets fly by, for example, and working with large Illustrator files is no



The Radius Rocket is the fastest accelerator on the market. At a price that rivals that of Apple's Mac IIfx Logic Board Upgrade kit, it can accelerate a Mac II by 245 percent. The Rocket's 68040 chip and its massive heat sink (center) dominate the jam-packed NuBus card.

longer as painful as an IRS audit.

For a more objective evaluation, MacUser Labs used a variety of benchmarks that mimic a typical high-end user environment to compare the performance of a plain Mac IIx and one with a Rocket (with 32 megabytes of memory) installed. We also compared the Rocket-equipped IIx's performance with that of a Mac IIcx. Both Macs contained a block-mode-compatible Radius DirectColor/24 board and an FWB Hammer 300-megabyte external hard drive.

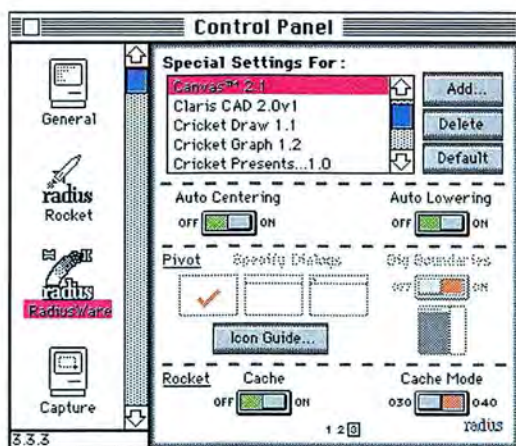
To show industrial-strength image processing on the IIx with the Rocket, we performed a 3-D ray trace with StrataVISION 3d. The IIx with the Rocket was almost four times as fast as the regular IIx. Compared with the IIcx, the Rocket machine sliced the processing time by a third. When the Rocket was installed, rotating an image in Photoshop 2.0 resulted in an almost fourfold performance gain over the standard Mac IIx.

In addition, a recalculation of an 8-x-2,076-cell Excel 3.0 spreadsheet resulted in performance that was more than four times as fast when the Rocket was used on the IIx and almost 50 percent faster than the performance of the Mac IIcx. Tests that involved changing more than 15,000 occurrences of a single word in a Word 4.0 document showed the Rocket-equipped machine to be more than three times as fast as the standard Mac IIx.

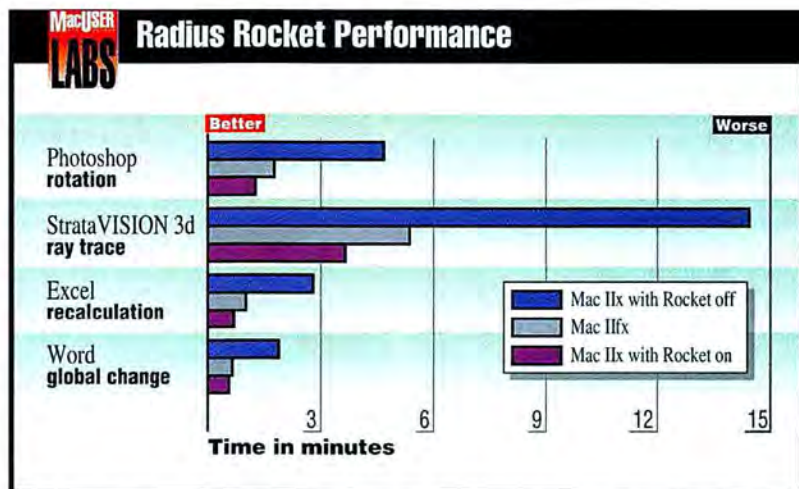
Overall, the Rocket-equipped Mac IIx achieved an impressive 245-percent performance gain when compared with the standard Mac IIx and an overall 48-percent gain when compared with a Mac IIcx.

Using a Rocket is a way to make a Mac faster, which is not the same as making a faster Mac. Several software and hardware incompatibilities may limit the Rocket's usefulness. Users moving to System 7 will need the next release of the Rocket software, which Radius promises will be available by the time this review appears. A/UX compatibility, however, is not planned.

It does have incompatibilities with such programs as Silverlining, SoundEdit, and DeltaGraph. Also problematic are programs (usually games) that do not use Apple's Sound Manager. The hardware-incompatibility list includes the RasterOps 224, 8L, 24L, and 108+ video boards; the DoveFAX modem; any Mac IIci cache cards; and the Cayman GatorCard. Radius is aware of these incompatibilities and is



The RadiusWare control panel allows you to set the cache mode of the Radius Rocket for individual programs. That's a real plus, because some programs, such as Microsoft Excel 3.0, aren't compatible with the 68040 mode. Radius supplies 68030 default settings for more than 70 such applications.



Based on MacUser Labs' overall test results, a Rocket-equipped Mac IIx proved to be more than three times as fast as a standard Mac IIx and 48 percent speedier than Apple's fastest Mac, the Mac IIcx. Graphics applications showed the biggest performance gain, but even nongraphics applications such as Excel and Word performed faster with the Rocket.

working with the various vendors to eliminate them (all but the problem with the Mac IIci cache cards).

The Bottom Line

The Radius Rocket's greatest appeal will be to Mac II and IIx owners who are looking to upgrade their machines without the additional cost (namely for new memory chips and, in the II's case, a new disk drive) associated with Apple's Mac IIcx Logic Board Upgrade kit. With an aggressive Mac IIcx and IIci upgrade to the 68040 processor, however, Apple could deal the Rocket a fatal blow when it introduces its next generation of CPUs. Until then, and perhaps beyond that time, if you're a Mac II user looking for the fastest possible Mac, do yourself a favor and check out the Rocket. The software

and hardware incompatibilities, some of which are significant, are reminiscent of the Mac IIci's initial problems. So you can be reasonably assured that they'll be cleared up with updated software and ROM chips in the near future.

— Jeffrey A. Steinberg

Get Info

Radius Rocket

Manufactured by: Radius, Inc.,
1710 Fortune Drive, San Jose, CA
95131; (408) 434-1010.

Version: 1.0.

List Price: \$3,495.

ELECTRONIC MAIL

Microsoft Mail 3.0

Building on Mail's solid architecture and performance, Microsoft adds handy new features for handling and organizing E-mail.

To date, Microsoft has failed to extend the iron grip it has on the Mac spreadsheet and word-processor markets to the realm of E-mail. This is the domain in which CE Software's QuickMail has enjoyed widespread success. With Microsoft Mail 3.0, however, Microsoft has added significant new features that are attractive to users as well as network administrators. Although both Mail and QuickMail offer advanced features such as gateways to remote sites and the ability to enclose multiple files with mail messages, Mail clearly outshines QuickMail when it comes to server architecture and performance.

The Basics of Mail

The Mail package consists of user software and server software. It's not necessary to dedicate a Mac as a mail server, because Mail can run on a Mac that's also operating as an AppleShare file server, a print server, or a software bridge and router. Mail's Network Administrator application — software for adding and deleting users and groups — also resides on the server, although you can access Network Administrator from any Mac on the network.

You log on to Mail in the Chooser in the same way you log on to an AppleShare server. You can also set Mail to log you on automatically when you boot your Mac. After you're logged on to the system, you can use the Apple menu to access Mail's Summary window, which is where you read and send messages.

Mail's interface has some noteworthy strengths as well as a few weaknesses. When mail arrives, a window pops up and displays the message title and the name of the sender so you can decide whether to interrupt your work to read the message. If you don't like this feature, you can turn it off. This level of customization extends to the Address Mail window, which comes up first unless you choose to display a message-composition window first. You make this change by using Mail's Preferences command. You can also eliminate

the Address Mail window altogether and have a simplified scrolling user list appear in a message-composition window. Unfortunately, these choices are obtusely labeled and are not immediately evident.

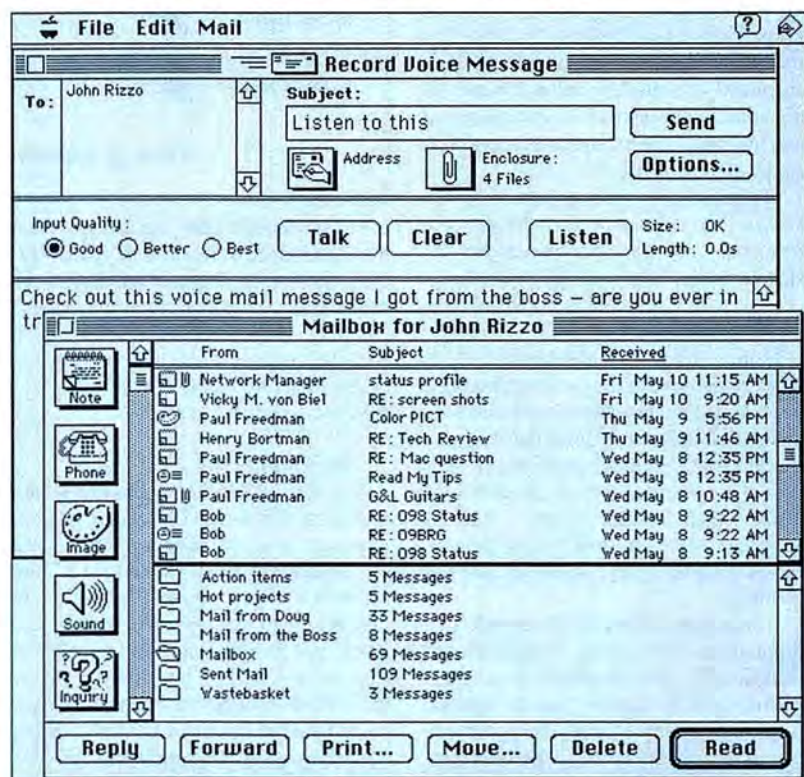
Other annoyances include the inability to resize windows and to retrieve messages after you've sent them, which you can with QuickMail's Unsend command. We also found that incoming messages set off the virus alarm of SAM (Symantec AntiVirus for Macintosh) when SAM was set at its advanced level.

Fortunately, Mail 3.0 makes up for these deficiencies by providing top-notch mail-handling features. When you send files, for example, you can enclose an

entire folder of files by clicking on a button (although folders within folders are not maintained). By contrast, QuickMail users must select files within a folder individually to send them. QuickMail limits you to 16 attached files, but Mail lets you attach an unlimited number of files. Mail recipients receive a list of the attached files with the message, whereas QuickMail users must go to another window to see what's attached.

Another useful Mail 3.0 feature is the ability to store folders on the server, which means you can organize the messages you receive without downloading them from the server first. You can create project, subject, or category folders, for instance, and sort mail accordingly. To move messages to folders, simply click and drag message titles to the folder list at the bottom of the Summary window. You can also save messages on your hard disk as text files.

New links to Word and Excel let you open mail messages from within those applications, and you can enclose the Word or Excel document you're working on with a message.



Microsoft Mail 3.0 makes E-mail more efficient by letting users enclose an unlimited number of files with messages *plus* images and sound. Version 3.0 also lets you create folders on the Mail server to help you organize stored messages.



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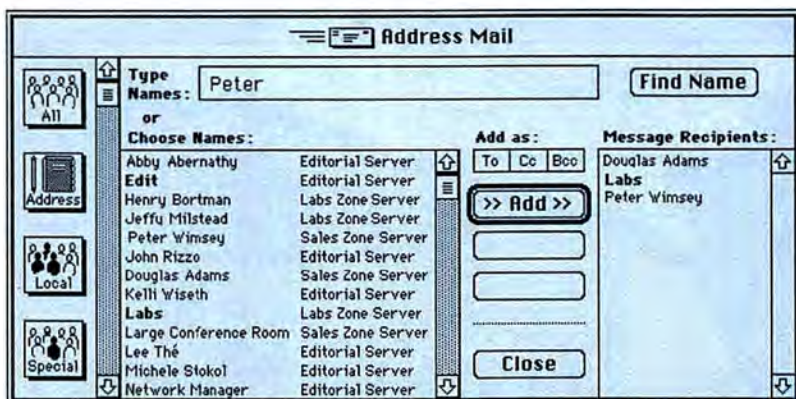


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*Contact QMS for availability of network options.

*Patent pending



An important feature of Microsoft Mail 3.0's server software is its ability to automatically update the user lists of multiple servers in multiple zones, so the network never gets bogged down with useless mail that's been sent to users who are no longer on the network. By clicking on the Local button, you can also see a list of the users in your zone who are currently logged on to Mail.

You can customize and create message forms with the Mail Forms Designer, a HyperCard stack that's included with the package. Several forms are included that let you send images and sound with your mail messages. The Voice form, for example, lets you copy and paste sound from such programs as Farallon's SoundEdit and then play, fast-forward, and store the sound as an snd file. To use this feature, you need a microphone and a sound driver (such as those included with the Mac Classic, LC, and IIsi) as well as System 6.0.7 or later.

The Heart of Mail

Although the user software provides the most visible and familiar aspect of an E-mail package, its performance and connectivity strengths are determined by the software that runs on the server. This is where Mail truly shines. Its server software stores only one copy of a message, no matter how many people it's addressed to. QuickMail's current server (version 2.2.3), on the other hand, creates and stores a copy of the message file for each recipient, which uses much more disk space and can seriously degrade server performance. (For an in-depth look at how mail servers work, see "Mail Call," July '90, page 92.)

Mail's server architecture provides performance that's downright snappy. We tested Mail with 20 users in two zones separated by a router. Even when we accumulated hundreds of messages on several nodes, performance was unaffected. Opening the Mail DA took 4 seconds with 225 messages accumulated;

QuickMail required about 25 seconds to open with 110 accumulated messages. Sending and receiving messages were also faster with Mail. However, downloading 16 attached files (about 650 megabytes' worth) took about a minute and a half with either system.

Mail 3.0 also does an outstanding job of handling multiple servers in different zones. Each server shares its user list with other servers on the network automatically, so users can see a list of *all* the users on the network, not just those in a particular zone as is the case with QuickMail. This makes it easier to send messages to multiple zones. Even more importantly, because the Mail servers automatically update each other's user lists across zones, mail can't be sent to users who have been deleted from the network.

QuickMail makes you manually update the user lists from other zones. This causes problems when users who haven't updated their lists send messages to users in other zones who are no longer on the network. The QuickMail server stores these messages, taking up valuable disk space and bogging down the server.

The server architecture also adds flexibility to the way groups are handled. Like other mail packages, Mail lets you name and add groups of addressees to the user list. These groups can be universal groups created by the network administrator for everyone's use or personal groups created by individual users for their own use. Users can also create personal address books with their most frequently used groups and addressees. In addition, Mail lets you see who is in a particular group

from the Address Mail window and choose users from within a group for a message without altering the group.

Mail is completely System 7-compatible. The servers and the users' Macs can run either System 6 or 7 without problems, although balloon help wasn't implemented in the version we tested. We tested Mail on a mixed network with both operating systems and encountered no problems.

Mail can connect to networks at other sites via modem and offers dial-in remote-access capabilities. Third-party products are available that allow Mail to connect to QuickMail, mail systems on VAX computers, wide-area networks, and MCI Mail. Gateways to other mail systems appear when you click on the Special button in the Address Mail window.

The Bottom Line

Microsoft Mail is the best choice if you plan to use multiple servers in different AppleTalk zones. The ability it gives its servers to see each other's user lists and automatically update them is a significant advantage over the methods of other E-mail systems. The server architecture is particularly well designed, providing solid performance and reliability as well as the capacity to handle large-scale network expansion.

Furthermore, version 3.0 makes it easier than ever to send and organize messages. You can enclose folders with messages as well as an unlimited number of files, and the software lets you organize the messages you receive in folders on the mail server. You can also send images and sound with your messages. Mail lacks a command for unsending messages, but overall, Mail is distinguished by a solid base that's unlikely to crack as the program evolves in future versions.

— John Rizzo

Get Info

Microsoft Mail

\$\$\$ 1/2

Published by: Microsoft Corp., One Microsoft Way, Redmond, WA 98052; (800) 426-9400 or (206) 887-8080.

Version: 3.0.

List Price: Microsoft Mail server software, \$395; Mac-workstation versions: 5-user pack, \$395; 20-user pack, \$1,349.

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GRAPHICS & DESIGN

PixelPaint Professional 2.0

With new tools and a revamped interface, PixelPaint Pro can hold its own against any of the Mac's top-notch painting programs.

PixelPaint Pro 2.0 is not just another upgrade to the first 24-bit-color painting program for the Mac — it's a major revision that adds new tools and a spanking new interface. The result is a refined painting program that rivals Studio/32 and Oasis.

New Look and Feel

PixelPaint Pro 2.0 eliminates the restrictive, single-document windows and the fixed palettes of its predecessor. The new version lets you open multiple documents simultaneously (memory permitting) and adds new floating palettes for tools, color mixing, and coordinate display. In addition, new painting implements, including charcoal, pastel, and rubber stamp as well as new selection tools such as magic wand and cropping allow more-sophisticated techniques.

Professional graphic artists will welcome PixelPaint Pro's new Bezier-curve tool. For ease of use, new tool modifiers, visual effects, and fill effects are now located on convenient, context-sensitive pop-up menus accessible from buttons on the Tool palette. The ability to select different path modes (continuous, polygonal, spline, discontinuous, and random) for all painting tools is also particularly useful.

Even with mouse input, PixelPaint Pro capably mimics the real-life effects of pressure on the process of media application. The use of PixelPaper, a collection of nine template documents that simulate the texture of painting surfaces, heightens the illusion. In addition to this, PixelPaint Pro's painting tools respond to pressure-sensitive graphics tablets, such as those from Wacom and Numonics. Altogether,

this combination makes PixelPaint Pro 2.0 an excellent emulator of traditional media and methods.

One of the best new features of version 2.0 is Wet Paint, which gives the forms you create more flexibility and manipulability by mimicking drawing in an object-oriented program. When you draw a line or geometric element, it appears on-screen as an editable line object with control points. When you're satisfied with its placement, you can click a second time to merge the object into the bit-mapped image below.

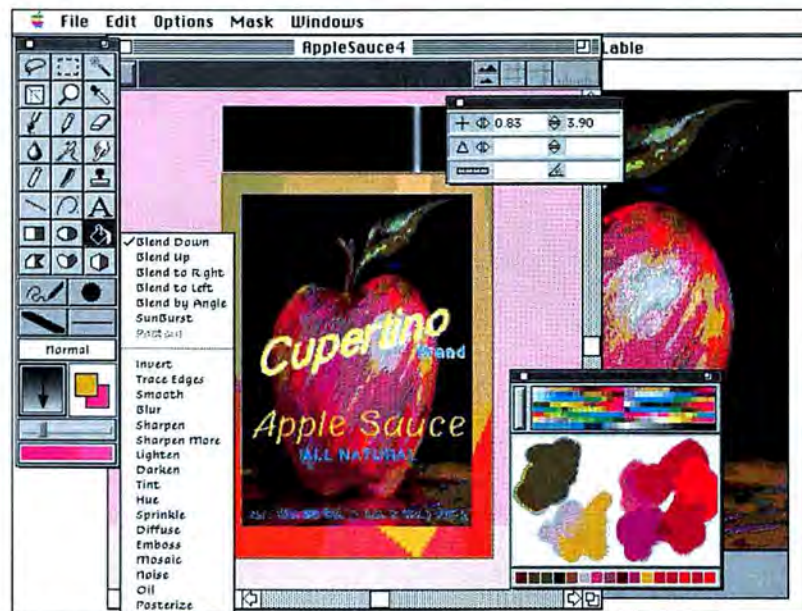
Although PixelPaint Pro offers various dynamic transformations, such as flips and rotations, it's still not as quick or versatile as Studio/32 in this regard. Complex effects such as scaling, distortion, and free rotation, for example, are still off-limits to images selected with the lasso. On the other hand, Studio/32 lacks PixelPaint Pro's excellent mesh-warp effect, which overlays an image with a matrix of control points, letting you gradually distort it.

Zoom views now extend over an entire window, replacing the split-screen approach of earlier versions. The larger magnification area is welcome, but what's still missing is an actual-sized view, which is particularly useful for large images.

Text handling in PixelPaint Pro is flexible but cumbersome. Each letter has control points for individual placement while text is still "wet." But you're required to enter text and set its characteristics in a dialog box. As a result, testing different sizes and styles of text can be tedious. Anti-aliasing and support for Adobe Type Manager produce sharp, high-quality results. And early converts to TrueType will be interested in PixelPaint Pro 2.0's support for Apple's new outline-font format. The program also supports balloon help and System 7's publish-and-subscribe, which lets you post updates to your image directly to other applications such as page-layout programs. As a bit-mapped graphics program, PixelPaint Pro does not support the object-oriented subscribe function.

Color Support

As with previous versions of PixelPaint Pro, you access the program's 256-color Color palette via the Tool palette. Five new gradients are available, as is a slider control that lets you adjust transparency on the fly. In dialog boxes, the program provides sliders for brightness, contrast, and color balance.



PixelPaint Pro 2.0 is an impressive revision of the Mac's first 24-bit-color painting program. A well-designed new interface offers multiple-document capability and floating palettes plus access to special effects from the Tool palette. And you can mix colors on-screen. PixelPaint Pro 2.0 is also the first painting program to support System 7's balloon help, publish-and-subscribe, and TrueType outline-font format.

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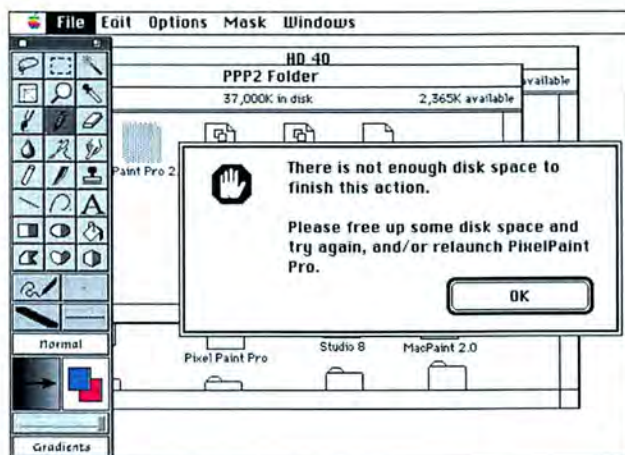
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PixelPaint Pro's restyled Color Editor lets you switch to any of 16 preset palettes, and you can also customize your own. You select colors by using the Mac color wheel or pickers based on traditional color theory: RGB, HSV, CMY, and the Pantone Matching System. If you're using SuperMac's SuperMatch Display Calibrator to correlate on-screen colors with colors produced by specific output devices, the TekColor picker replaces the Mac color wheel as the default selection method.

With all these options, it's surprising that PixelPaint Pro 2.0 cannot save custom color palettes, especially considering that earlier versions had this feature. Because palettes reside with documents, they can be preserved in template files, but saving palettes independently was a better solution. Graphic artists who need to work repeatedly with specific colors will miss this convenience.

A real plus for professionals, however, is PixelPaint Pro's new color-separation support. Although such support is common in image processors such as ColorStudio and Photoshop, PixelPaint Pro is currently the only color painting program to support color separations. In fact, the complement of available printing options, including halftones and duotones, in PixelPaint Pro 2.0 is one of the program's distinguishing strengths.

PixelPaint Pro is adept at reading and writing graphics file formats besides its native format (PixelPaint 2.0). It can read the original PixelPaint format, PICT, paint, and TIFF and write to PICT, TIFF, EPS (PostScript), and Scitex CT file formats. The Scitex CT format is especially significant for many professional publishing environments.

PixelPaint Pro's new virtual-memory scheme is sometimes more of a liability than an asset. Here, even with 8 megabytes of RAM and more than 2 megabytes of disk space, PixelPaint Pro 2.0 refused to open a 500K file.

Virtual-Memory Scheme

PixelPaint Pro's virtual-memory scheme is a mixed blessing. Because 24-bit color requires copious amounts of memory (multimegabyte files are common), PixelPaint Pro retrieves portions of open documents from disk when needed, rather than keeping entire images in RAM. As implementations of virtual memory go, this is a good one. Documents can be as large as 4,000 x 4,000 pixels, and users can scroll to off-screen image segments without changing view modes.

If you don't have enough RAM, virtual memory is a godsend, but there are trade-offs in operating speed and disk utilization. Programs that use virtual memory must access the hard disk as mandated by image changes, and the temporary files required for virtual-memory documents are large.

PixelPaint Pro reserves RAM for documents, so it goes to disk for everything from Clipboard operations to dynamic transformations of on-screen image segments. Never the speediest program, it suffers from the resulting continual disk accesses.

Moreover, PixelPaint Pro's virtual memory is always on. So instead of being restricted by RAM, the program is constrained by disk space. Even with 8 megabytes of RAM at its disposal, PixelPaint Pro couldn't open a 500K image without approximately 3 megabytes of available disk space.

As a concession to simplicity of operation, an on/off toggle for virtual memory was removed from the program before release. Granted, some novices might be flustered by memory-management issues, but the freedom to allocate RAM and disk space according to the task at hand would

make PixelPaint Pro more useful.

In delivering professional rewards, PixelPaint Pro makes decidedly professional demands on both hardware and memory. The minimum configuration for running the program is a Mac II with 4 megabytes of RAM and System 6.0.5 or later. For effective MultiFinder use, you need 8 megabytes. And to make full use of the software's functions, a 24-bit-video card (preferably with built-in acceleration) is required. One caveat: SuperMac reports PixelPaint Pro incompatibilities with Apple's Macintosh Display Card 8•24 gc. And finally, you need a high-capacity hard disk—the bigger the better. Although SuperMac recommends a minimum of 3 megabytes of free disk space for PixelPaint Pro, professionals will likely end up devoting an entire disk drive to it.

The Bottom Line

Although late in arriving, PixelPaint Pro 2.0 nonetheless feels a little rushed. For example, when you magnify an image, horizontal lines are draped across the screen, and painting tools in Zoom mode also leave a trail of lines. These apparitions don't affect images, but they really shouldn't be there. There's no question that PixelPaint Pro 2.0 is a vast improvement over its predecessors, but it doesn't always look as if it's completely finished.

That said, PixelPaint Pro 2.0 is a valuable renovation of one of the Mac's most popular painting applications. Although not as crisp in operation as Studio/32 and perhaps not as artistically intuitive as Oasis, it's a worthy competitor with some special features. Mac graphic artists tend to collect programs the way traditional artists collect brushes. Most won't be able to resist this one.

— Carlos Domingo Martinez

Get Info

PixelPaint Professional 2.0

!!!!

Published by: SuperMac Software, 485 Potrero Avenue, Sunnyvale, CA 94086; (800) 345-2888 or (408) 245-2202.

Version: 2.0.

List Price: \$799.

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Like oil and water, databases and desktop publishing don't mix. Most page-layout applications don't support the smooth importation of text from a database without complicated processing. Enter DataShaper, a tool that joins the disparate worlds of databases and page-layout programs. Although DataShaper requires programming and planning up front, it saves considerable time that you would otherwise spend preparing database files manually.

Order out of Chaos

Databases are foreign to most DTP programs because of the way the information is stored. Any standard database program exports its information as tab-delimited files: text files with tabs (or commas) between the fields and a carriage return after each record. When you import a tab-delimited file into a page-layout program, you end up with a mess. Instead of flowing smoothly, as a word-processing document does, the file has its justification thrown off by the tabs. And just stripping the tabs out isn't a good solution, because you end up with unformatted text that all runs together.

That's where DataShaper comes in. The program acts as a PageMaker filter, converting tab-delimited files as they are imported into a layout. The tabs (or commas) are stripped out, and in their place, styles are assigned to each field.

As simple as this sounds, the process requires some fairly extensive groundwork. The easy part is deciding how you want your information to appear on the page and setting styles with point sizes and fonts — elementary stuff for savvy PageMaker users. Then comes the tedious part: You must write the PageMaker filters for the data yourself, using DataShaper's esoteric coding. The code comprises placeholders that represent each field inside a record. You then assign the appropriate style to the placeholder.

Writing the filter code requires great attention to detail, and it can quickly get confusing. Every field's placeholder starts with the symbols %% and ends with a successive letter of the alphabet. For example, in a company database, the filter for name, street address, city, state, and ZIP looks like this: %a %b %c %d %e. The program can accommodate as many as 260 fields, with the addition of a numeral before each letter. For styles, if you want the company name to appear in bold 10-point Times italic, you assign that style to the placeholder %a.

You can also add text to the fields. For example, to have a comma fall after the name of each city, you create the filter as

follows: %c, %d. And the text isn't limited to single characters: You can also add words or paragraphs.

Once completed, the filter file automatically converts each record in the database to an assigned style as the text flows into PageMaker.

More Power to You

This in itself is a lot of power over publishing, but DataShaper automates the process even further. For dividing your information into categories (such as geographical regions for a company database), DataShaper lets you add category heads and/or subheads.

DataShaper also supports PageMaker's

Company	Address	City	State	Zip
Aldus Corp.	411 First Ave. S.	Seattle	WA	98104
ElseWare Corp.	713 NE Northlake Way	Seattle	WA	98105
MacUser	950 Tower Lane, 18th Floor	Foster City	CA	94114

Before: DataShaper brings order to chaos when you're importing database files into PageMaker. This is how a raw text file from a database looks when imported into PageMaker without DataShaper. The arrows indicate tabs.

```
%%a
%%b
%%c, %%d %%e
Phone: %%f
```

The filter: The DataShaper filter file contains placeholders that represent each field in the database. As you import text files through the filter and into PageMaker, tabs are stripped out and styles are assigned.

Phone: (206) 628-2320

ElseWare Corp.

713 NE Northlake Way

Seattle, WA 98105

Phone: (206) 547-9623

MacUser

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After: After passing through the DataShaper filter, the database information is fully formatted and words have been added where appropriate (Phone:, for example). All this was done in a tenth of the time it would have taken to manually prepare the files for PageMaker.

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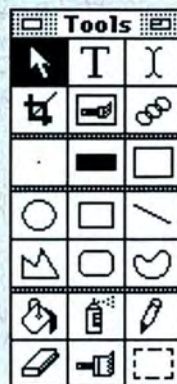
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indexing features, by letting you define a field as an index entry. You can optionally display the field or leave it out of the page layout — a nice feature if you use indexed keywords for each entry but don't want those keywords displayed anywhere except in the index.

And there's more. DataShaper goes the whole nine yards in DTP by letting you place graphics in your layout based on information in the database. For example, if you have scanned logos on your hard disk for a company database, you might want to have DataShaper search the disk for images associated with specific names. Unfortunately, this doesn't extend to EPS graphics, the most popular format for desktop publishers. However, DataShaper does import paint, PICT, and TIFF files.

DataShaper provides several templates, including directories, catalogs, mail-merge, envelopes, Avery mailing labels, and a calendar of events. You can even add postal bar codes to an envelope, using a special font included with DataShaper.

The Bottom Line

DataShaper is a powerful tool that's not for the faint of heart when it comes to programming, but if you're willing but inexperienced, you'll be glad to know that the program is somewhat forgiving of coding errors. And although the learning curve is steep, DataShaper's tutorial is excellent, providing step-by-step instructions for the entire coding process.

Its power aside, DataShaper would be more accessible to a broader range of users if it were more WYSIWYG. As it is, the program requires a meticulous eye when it comes to coding.

If you use PageMaker and need to publish a database, DataShaper is for you. You'll have to do some programming, and preparing the filters for PageMaker is time-consuming, but DataShaper will save you hours over manual preparation each time you use it.

— Ben Templin

Get Info

DataShaper

\$\$\$

Published by: ElseWare Corp.,
713 N.E. Northlake Way, Seattle,
WA 98105; (206) 547-9623.

Version: 1.2.

List Price: \$149.95.

GRAPHICS & DESIGN

Infini-D

Infini-D packs modeling, rendering, and animation into a truly outstanding 3-D-design package.

For less than \$900, graphics professionals can explore the world of 3-D design with a package that rivals high-end 3-D software. Infini-D, the latest entry in the burgeoning 3-D-design software arena, is a modeler, renderer, and animator that offers true object metamorphosis, free-form objects, 32-bit ray tracing, time-based animation, and multilayer surfaces. What's more, Infini-D's impressive functionality is presented in a well-integrated package that's surprisingly straightforward and easy to use.

From Primitives to Free-Forms

For modeling, the \$895 Infini-D hovers somewhere between a CAD package and a 3-D modeler. You can create a wide variety of shapes with Infini-D's modeling tools, but the program lacks the absolute precision of CAD software. Infini-D uses an internal scaling system, which makes it a good choice for concept design but not for real-world drafting.

As an alternative to modeling with Infini-D, you can import models created in CAD packages and saved in the DXF file format. However, be aware that the DXF format is not set in stone. Unlike the reliable process of converting PICT-format graphics to TIFF format, converting files to DXF format can distort or rescale the original graphic.

Infini-D supplies six basic predefined primitives for modeling: cubes, spheres, cylinders, cones, 2-D squares, and infinite planes. You can also model more-sophisticated objects in the program's 3D WorkShop, using its lathe, extrude, and free-form tools.

A key advantage of Infini-D over other 3-D-design packages is the ease with which you can modify objects once you've created them and positioned them in a 3-D scene. Infini-D lets you edit objects away from the clutter of scenes simply by double-clicking on the desired object. The program automatically selects and opens

it in 3D WorkShop, where you can make your changes.

As you're modeling objects, Infini-D provides multiple views of your work. Standard views (including Top, Front, and Right) offer fixed perspectives of the 3D WorkShop. The Camera View lets you rotate your point of view. By letting you change views, Infini-D makes it a breeze to create asymmetrical, odd shapes with extreme precision.

Move tools let you move objects through vertical or horizontal planes for accurate placement in your world, or scene. Rotation tools rotate objects around a default center point, but you can easily alter the rotation point to allow for combined objects such as hinged doors or elbow joints. You can scale objects uniformly or resize them nonuniformly, using the squash and stretch tools. An extensive dialog box is available for specifying exact parameters for any of these actions.

Hierarchical grouping of objects is available for making complex assemblies from simpler components. What sets Infini-D apart from other 3-D packages in its price range is that its object grouping is far more sophisticated and multifaceted. With the ability to define complex interrelationships among objects, you can create realistic animation sequences by specifying how interrelated objects move relative to each other in your 3-D world.

Specular International, Infini-D's maker, shows a definite enthusiasm for fractals, with impressive results. Infini-D's terrain tool lets you create instant landscapes by defining the parameters of mountains (or molehills, for that matter). Because the program models the resulting land masses in a random fashion, they exhibit a natural realism that's difficult to match with traditional hand modeling. The ease of creating compelling terrains makes the process downright addictive.

On the Surface

In addition to ray tracing, Infini-D provides five rendering modes that give color, texture, and other surface qualities to your models. Each mode represents a different trade-off between image quality and rendering time. Of course, the higher the quality of the image, the longer it takes to render. In general, it's best to construct scenes in Wireframe mode and then check the progress of your designs, using the various rendering modes, before doing ray tracing.

One drawback of Infini-D is that ray



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REVIEWS



Infini-D is a 3-D-design package that excels at creating realistic terrains and complex surface textures. The fractal mountains shown here were rendered in Best (Phong Shaded) mode and stripped in with Photoshop. Even so, the ray tracing took about three days to complete.



When you launch Infini-D, you see four default View windows: Top, Front, Right, and Camera. The first three are fixed views, but you can rotate or zoom in Camera View.

tracing takes place in RAM, so if you experience a power interruption or some other disaster that knocks out your Mac, you have to start the process from scratch. This is not a trivial problem, considering how time-consuming ray tracing can be. System 7 users can get around this problem by using virtual memory for ray tracing, because Infini-D is 32-bit clean. However, using virtual memory is quite a bit slower than doing ray tracing in RAM.

Another of Infini-D's strengths is in its handling of surfaces. Any ray tracer provides the basics: transparency, reflectivity, refraction, and cast shadows. These are mere starting points for Infini-D, however. The package includes fractal mapping, tiling, bump mapping, and corrosion. There is even an editable wave effect that looks like rippling water. An extensive library of predefined surfaces accompanies the package, and shareware surface libraries are also available on America Online to supplement these.

To create custom surface compositions, you can combine Infini-D's surfaces with imported PICT or PICS picture files and map the results to any object. The program offers five types of surface maps — Color, Bump, Transparency, Reflection, and Glow — as well as six ways to

wrap a surface around an object. The ability to layer and blend all varieties of surfaces is unique to this class of modeling programs.

You can animate all objects in Infini-D and export the animations you compose to other applications, such as MacroMind Director. Infini-D's Sequencer, which edits objects in time, is an event-driven, time-based system that looks for changes in scene objects. This approach differs markedly from the traditional key-frame method most other rendering packages use and somewhat resembles MacroMind Director's Score.

Professional animators will be pleased that SMPTE time code and not the inaccurate clock chip supplied with the Mac manages the Sequencer. The Sequencer's configurable Timebar displays time to a hundredth of a second or in terms of frame numbers, which allows for exact interfacing with high-end animation systems and video equipment.

You can set objects, lights, and cameras to move around scenes on linear or spline paths. Lights and cameras can be locked to objects or to each other to maintain constant effects as you move about in your 3-D world. Infini-D's ability to interpolate virtually anything is what

will cause most animators to sit up and take notice. Not only can Infini-D smoothly blend changes in position, orientation, and dimensions over time but it can also interpolate surfaces, lighting colors, and even object shapes. Specular International plans to add TrueType metamorphosis as well, by the third quarter of the year.

The minimum configuration required for running Infini-D is a II-class machine with 4 megabytes of RAM, 8-bit video, a hard disk, and 32-bit Color QuickDraw. Power users, especially animators, will want to use the fastest machine they can afford, equipped with a large monitor, 24-bit video, loads of RAM, and every conceivable accelerator. Ray tracing is a processor-intensive activity, and large, complex images for prepress or long animations can take many hours or even days to process.

The Infini-D package consists of two disks, a tutorial, and a users' manual. The documentation is clear and succinct and includes many clever analogies that speed the learning process. Infini-D is a product with depth, so careful study of the manuals is a necessity. Specular International maintains a forum in the Industry Connection section of America Online as well as a helpful tech-support staff to assist in troubleshooting problems.

The Bottom Line

Infini-D represents a quantum leap for 3-D-design packages priced at less than \$1,000. No other competing product in its class comes close to matching Infini-D's power and the quality of its features, effects, and performance. Moreover, the program's well-integrated path between modeling and rendering is a real strength that's further enhanced by a well-thought-out and intuitive interface. The program is a must-have for serious modelers, and even high-end-CAD users can benefit from its extra abilities.

— Doug Barnard

Get Info

Infini-D

\$\$\$½

Published by: Specular International, 233 N. Pleasant Street, P.O. Box 888, Amherst, MA 01002; (413) 549-7600.

Version: 1.0.

List Price: \$895.


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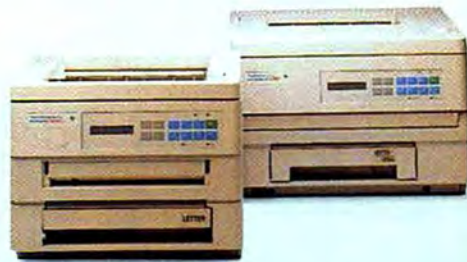
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DATABASES

ThoughtPattern

ThoughtPattern's unique database helps you keep a wide variety of information at your fingertips.

ThoughtPattern is a free-form database program with powerful search-and-retrieval capabilities that works much like an electronic index-card file, storing data from a variety of sources. Although it may sound like another HyperCard, ThoughtPattern provides ways to organize and locate data that no other package offers. Unfortunately, though, its innovative approach to personal-information management is marred by numerous bugs.

Pick Up the Tab

One of ThoughtPattern's advantages is that you don't have to create templates or fields before storing information in the

program's database. You simply type information or import it from other programs — if your database program can export data to a formatted text file, ThoughtPattern can import it.

ThoughtPattern organizes data and lets you search for and retrieve it, using *tabs*. In a ThoughtPattern database, each record is an *item*. Tabs are search words or phrases attached to particular items, and you can assign an unlimited number of tabs to each item. The most common way to create a tab is to select text from within an item. The program's CrossIndexing function then creates tabs for every item that contains matching text. You can also

create tabs for words not included in an item's text. All tabs linked to an item are easy to view on a pop-up menu.

The primary purpose of the tabs is to filter a database for a subset of items. When you select a tab, ThoughtPattern displays only those items associated with that tab. You accomplish more-complex searches with ThoughtPattern's filters, and you can create (and save) multicriteria filters (for example, all items that contain both *vacation* and *lake* as tabs).

ThoughtPattern provides two other filter criteria: priority levels and alarms. You can select a subset of all items assigned a specific priority (for example, high or low) or all items with alarms set for a specified time frame. ThoughtPattern alerts you when any alarm is triggered, but it does so only when it is the active application, which limits its usefulness as a substitute for appointment-calendar utilities such as Alarming Events.

ThoughtPattern also includes a Text Search command similar to HyperCard's Find command. This function would be

How to be social.

Think how much more effective your people would be if they could communicate better. That's the idea behind WordPerfect Office™ 3.0 for the Macintosh.

It's actually several programs in one. WordPerfect Office comes with a very versatile E-mail package (WordPerfect Office Mail™), that makes it easy for people on a

Macintosh network to keep in touch. The mail screen shows you everything you need to compose and circulate messages to an individual, to a group, or to the entire corporation.

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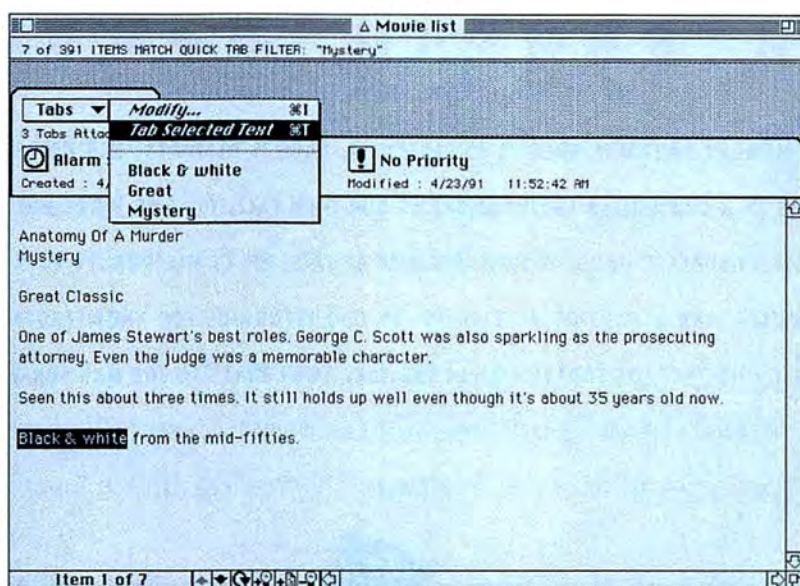
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more effective if you could use it for searching and replacing. As it is, making similar changes across multiple items is a cumbersome process.

Once you've set up your ThoughtPattern database, you can add, delete, and modify existing tabs a single item at a time or as a group. When a tab list gets too long for display all at one time, you can subdivide it into tab groups.

ThoughtPattern can also link other applications and documents to items, after which these applications or documents can be opened from within ThoughtPattern. When you quit, you're automatically returned to ThoughtPattern. This is a convenient feature for grouping related files and information. For example, ThoughtPattern can maintain notes for a manuscript and link them directly to the manuscript itself. Unfortunately, for this feature to work properly, the program must scan the desktop file each time it's launched. If you are using a high-capacity hard drive, this can take several minutes, especially on slower Macs. Bananafish Software says it



ThoughtPattern is a unique personal-information manager that uses words and phrases, or tabs, to filter items from its free-form database. Here, we created a tab by selecting the phrase *Black & white* from this movie item, which we imported from a Panorama database. The remaining text was added from within ThoughtPattern.

How to get a date.

Of course, open communication is only one of many ways to bring people together. That's why WordPerfect Office 3.0 for the Macintosh also offers an integrated calendar and network scheduler to help you make appointments, coordinate meetings, schedule events and company resources as well as make to-do lists.

Along with WordPerfect Scheduler and Calendar, WordPerfect Office includes other useful desktop utilities such as Notebook, a flat-file database program; File Manager to help you organize your files; and Forms Maker to create custom forms for Mail, Notebook, and Calendar.

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A Few Blemishes

ThoughtPattern succeeds in its primary goal: to provide powerful search-and-retrieval capabilities for an unstructured database. There's much room for improvement, however. For example, when working with tabs, you can't select a subset, such as those tabs that have been created since the last save, for cross-indexing. ThoughtPattern always cross-indexes every tab. And you can't replace one tab, such as *Pending*, with another, such as *Done*.

The program also suffers from a poorly written and inadequate manual, which has no screen shots or index. ThoughtPattern makes a subtle but significant distinction between filtered items and selected items, yet this distinction is never clearly explained. The program's menus and dialog boxes for tabs and filters are confusingly similar, and the manual lacks an adequate

explanation of their differences. ThoughtPattern also has limited sorting capabilities, yet sorting is not even mentioned in the manual! Fortunately, the program has an innovative on-line help system, similar to Apple's System 7 balloon help.

Even more serious are ThoughtPattern's numerous bugs. At times the text cursor vanished, so we couldn't add new text. Several files were inexplicably corrupted and wouldn't open. A variety of problems occurred when we attempted to delete items. And more than once, the system crashed completely. Bananafish acknowledges these bugs and claims they will be eliminated in version 1.2.

The Bottom Line

If you require a free-form database structure, ThoughtPattern may be just the ticket. Its tabs and filters provide a sophisticated set of features that is unavailable anywhere else. Before you make your purchase decision, though, you should consider ThoughtPattern's limitations. The

package desperately needs an improved manual, bug fixes, and more-flexible tab functions. Moreover, standard database programs can perform many functions, particularly those relating to sorting data and generating reports, that ThoughtPattern can't handle.

Given some time and effort on Bananafish's part, though, ThoughtPattern could become a useful tool for users who find conventional databases too rigid.

— Ted Landau

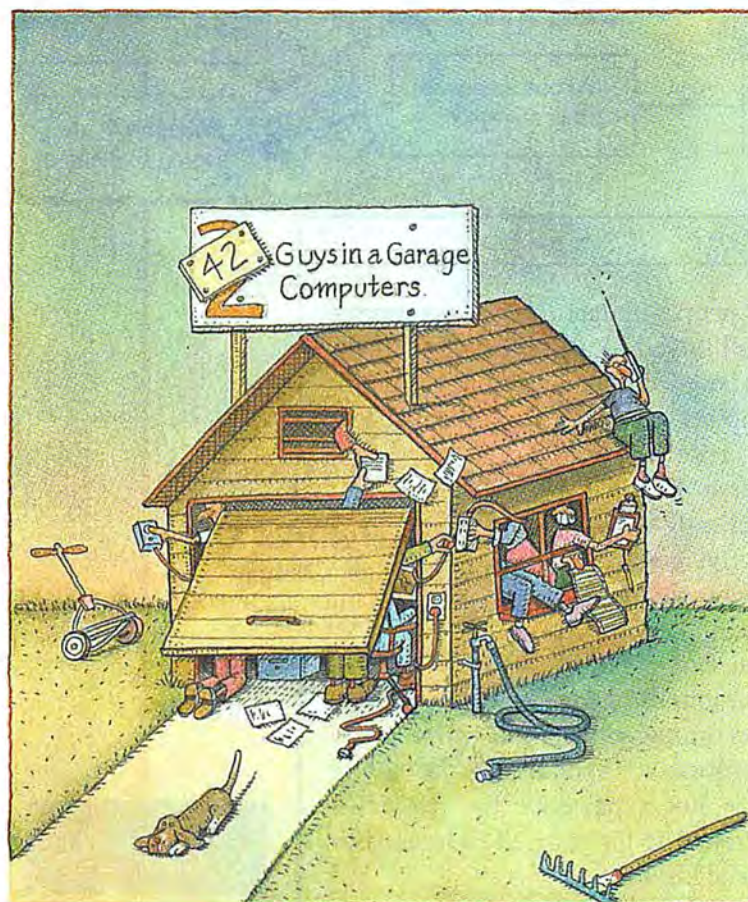
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Thought Pattern

Published by: Bananafish Software, Inc., 730 Central Avenue, San Francisco, CA 94117; (415) 929-8135.

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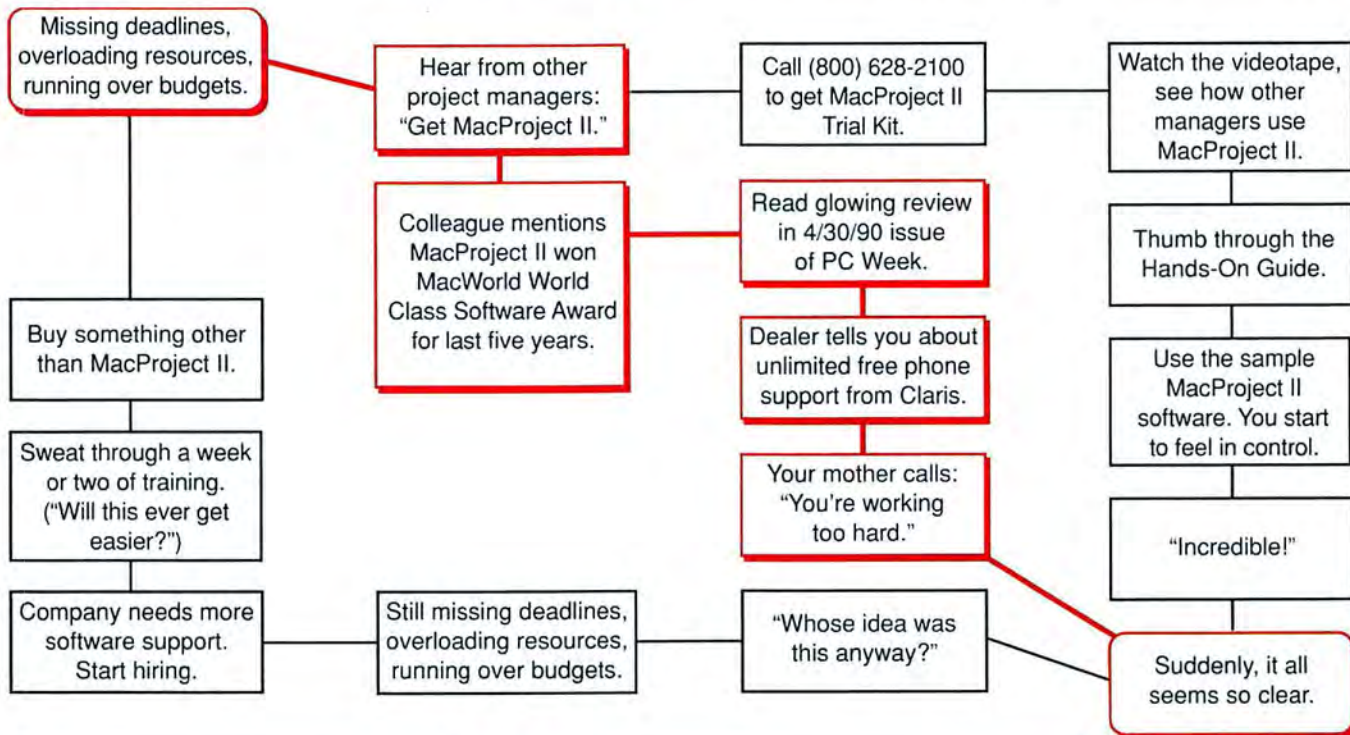
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FINANCIAL MANAGEMENT

Components Accounts Receivable and Components Accounts Payable

Combined with Satori's General Ledger, these two modules add up to an award-winning accounting solution.

Accounts Receivable and Accounts Payable are long-awaited additions to Satori's Components line of single-user accounting software. Both packages provide reporting flexibility and outstanding price/performance for accountants, small businesses, and controllers.

Accounts Receivable

The A/R (Accounts Receivable) system can handle as many as 252 special journals, which can be tailored for

product-, company-, or management-specific reporting. The system does an outstanding job of tracking financial data at different levels of a business operation. You can, for example, track product sales at the customer, sales, item, and territory level.

Once a sale has been recorded, the A/R system keeps track of open balances, using the balance-forward method. You can also opt for the open-item method to apply specific payments. And because the

system posts transactions in real time, you can generate up-to-the-minute reports after each entry. In addition, you can generate statements at any time, including the automatic calculation of finance charges for past-due accounts.

Although you can use the A/R system on a stand-alone basis, without integrating it with a ledger system, doing so limits its value as an accounting tool (in contrast to a cash-collection tool). Fortunately, Satori's A/R system interfaces directly with the company's other Components modules and all the Satori modules automatically share data.

Because it's difficult to anticipate the needs of every business, Satori has included a state-of-the-art report-writing and graphics tool with the A/R system for creating custom reports and business forms. The graphics portion of the program includes familiar drawing tools similar to those in many Mac drawing programs.

Satori's report writer can also do calculations on the fly, and you can use it to generate bar, line, and pie charts based on



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Territory Ledger

Terr: **MDV** Name: **South West**

Month Sales: **12355.45** YTD Sales: **114295.89**

Sales Rep. Ledger

Rep: **221** Name: **Thurston**

Month Sales: **0.00** YTD Sales: **0.00**

Item Ledger

Item: **1000-RT** Name: **Round Table**

Month Sales: **0.00** YTD Sales: **0.00**

Customer Ledger

Customer: **ABC-1000** Name: **ABC Company**

Current: **600.00** 61-90: **0.00** Credits: **0.00** Amount: **250.00**

31-60: **0.00** 91+: **0.00** Balance: **1404.00**

P. Date	Sp.	Invoice #	Charged	Check/Credit #	Payment	Balance
12/31/90	YHNG	9804	12.64			12.64
1/15/91	BN1	CF-1009	1718.74			1718.74
2/15/91	BN1	CF-1009	0.00	9203	1718.74	0.00
3/5/91	BN1	CF-1018	804.00			804.00
4/18/91	BN1	CF-1020	134.00			134.00
4/18/91	BN1	CF-1020	0.00	5678	134.00	0.00
4/18/91	BN1	CF-1020	0.00	5678	134.00	0.00
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5/8/91	BN1	CF-1025	200.00			200.00
5/8/91	BN1	CF-1024	300.00			300.00

Satori's Accounts Receivable module lets you track the same data at multiple levels of your business operation. Here, ledger cards display product sales at the customer, item, sales-rep, and territory level.

data stored in the A/R system. In addition, you can customize the system's interface by modifying the windows used for entering and using the system.

The A/R system is one of the fastest and

easiest to use on the market. It makes excellent use of the Mac's interface and provides a full audit trail, ages customer balances, and easily closes out every month's activity. And last but not least,

CHK-Check Journal

Date: **1/12/91** Vendor: **DEF-2000** Name: **DEF Manufacturing Co.**

☒ Manual Check ☐ Direct Purchase Check # **4029** Amount: **609.80**

Voucher #	Invoice #	Inv. Date	Inv. Bal.	Payment	Discount
AB-00001	123	11/16/90	89.80	89.80	0.00
AB-00003	123	11/22/90	520.00	509.60	10.40

Gerald O. Johnson
Seattle, WA 98121

January 12, 1991 **4029**

Pay Six Hundred Nine and 80/100 Dollars \$ **609.80**

To the Order of **DEF Manufacturing Co.**
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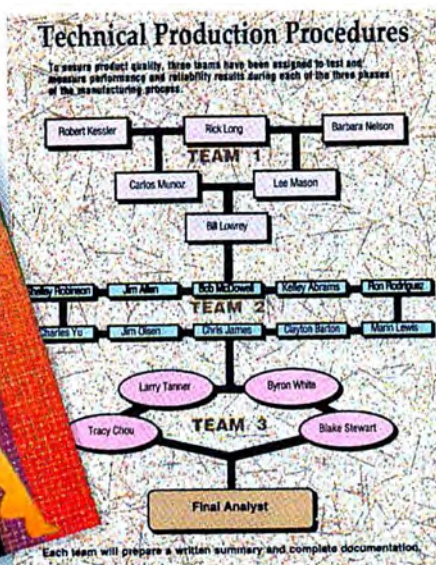
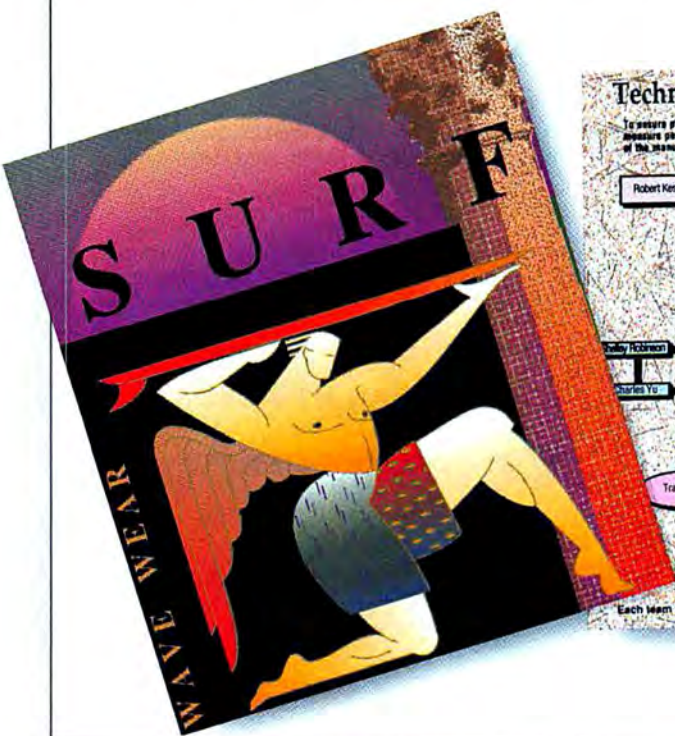
For Spare parts **Gerald O. Johnson**

⑈001043⑈ ⑆0123456789⑆ ⑆728 7068⑆

The Accounts Payable module uses a facsimile of a check to make managing payments as easy as managing your personal checkbook. In fact, using it may be even easier than employing your personal checkbook, because the program can reconcile your accounts with just a click.

the program's documentation is thorough and well designed. For small-to-medium-sized businesses that don't require a multiuser accounting system, Satori's packages should be an excellent fit.

It's a graphics program. It's a business program. Is not.



Accounts Payable

The A/P (Accounts Payable) system is an excellent complement not only to the A/R system but also to the entire Components line. A/P makes it a snap to set up account information, including bank information, payment terms, and expense items for disbursements.

Once you've added your vendors to the system, the software tracks every conceivable tidbit of information for paying and tracking bills. You enter data into the system primarily in one of two windows: Purchases and Checks. You use an interactive, customizable screen to record purchases. The check, or disbursement, section of the program uses an on-screen facsimile of a check, making the process of completing a check and making a payment totally intuitive. You manage the system exactly as you manage your personal checkbook.

Bank reconciliations are a breeze. You can compare your bank statement with the system-maintained check register. A simple click in the Clear column removes,

deducts, and updates the check, amount, and balance.

The A/P module also provides a complete set of management reports, including vendor-balance agings, month-end closings, and vendor summaries. The system handles a wide variety of journals, including purchase, check, bank entry, and credit, and it has a powerful data filter that screens data elements for inclusion in reports.

As with the A/R system, the A/P system includes drawing tools and bar, line, and pie-chart graphing tools and the documentation is excellent.

The Bottom Line

Satori's Components Accounts Receivable and Accounts Payable packages offer outstanding capabilities as well as price and performance advantages over Peachtree Software's Insight Expert Accounting Series or the Great Plains Accounting Series.

Evaluating the packages as stand-alones is difficult. What's clear is that to gain the

full value of both programs, you must combine them with the Satori Components General Ledger. The combination adds up to an award-winning business-accounting system that sports an excellent Mac interface and performance, very good documentation, and outstanding ease of use.

— Ken Landis

Get Info

Components Accounts Receivable

★★★★½

Components Accounts Payable

★★★★½

Published by: Satori Software, 2815 Second Avenue, Suite 295, Seattle, WA 98121; (206) 443-0795.

Version: 1.0.

List Price: \$795 each.

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Is so.

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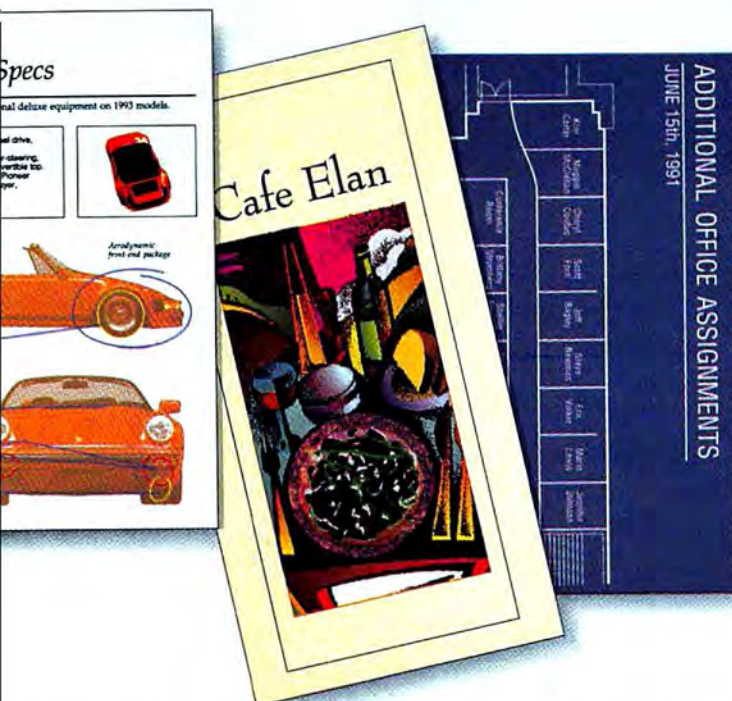
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JUNE 15th, 1991



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Color monitor illustration by Rob Mageira.

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The other members of the family are just as cost conscious. From the lightning fast "highly recommended" 660MB drive (*Macworld*, July 91)



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QUICK CLICKS



To inveterate Mac game players, news of a new Cliff Johnson game brings a sense of both anticipation and dread — anticipation of what new wonders Cliff's warped mind has produced this time around and dread of the amount of time that they'll spend playing the game (instead of making a living).

The man who brought us *The Fool's Errand* and *At the Carnival* has delivered *3 in Three*, and those feelings of anticipation and dread are well justified. The plot of this game is a bit *Tron*-esque: An innocent number 3 has been bumped off her (Cliff's anthropomorphism, not mine) rightful place in a cozy spreadsheet cell during a power surge and has fallen into the innards of the Mac. Even worse, the wayward 3 has fallen into *The Land of the Letters*, where the residents don't even know what a 3 is. The object: to get our hapless 3 home safely. As usual, that's easier said than done.

Along the way, there are plenty of opportunities to make fun of just how stupid computers really are. Humor abounds, as do brainteasers. As with earlier Cliff Johnson concoctions, the primary task involves solving puzzles — in this case, 80 of them on five menus. This time, however, there are no dead ends that force you to start over, so losing is impossible. If you run into a problem with one puzzle, you can try another. That's fortunate, because the infatuation level of some of the puzzles reaches an all-time high. This is to be expected: It is a Cliff Johnson game, after all.

The game contains the now-familiar mix of anagrams, word squares, logic puzzles, mazes, games with no rules until you figure them out, and number progressions. New forms of puzzles defy verbal description. Suffice it to say that Cliff has achieved a new level of weirdness.

The most impressive aspects of *3 in Three* are the sounds and the 256-color screens. The game has a five-minute, fully animated Prolog and a similar Finale, and connecting pieces between each puzzle contain dialogue and sound (look in the Finale for special thanks to Steven Sondheim, one of Cliff's most ardent late-night fans). The game has more than 60

minutes of animated screens all told, yet compressed, the two game files fit on one 800K disk! For those without color Macs, the game has special dithering routines that make the pictures look almost as good in black-and-white as in color. The game runs equally well on all Macs, and we found no compatibility problems. The only problem with *3 in Three* is hair loss — try not to pull out too much hair as the game's puzzles wreak havoc with your brain.

Inline Design, 5 W. Mountain Road, Sharon, CT 06069; (203) 364-0063. Version 1.0. \$49.95.

— Ken Gruberman



After Dark, the screen-saver utility from Berkeley Systems, is one of the more beautiful and whimsical solutions to the problem of screen burn-in. Version 2.0 has a total of 31 modules for your visual fascination.

The program works by monitoring your Mac and displaying animated screen savers after a user-specified period of inactivity. In addition to a variety of colorful screens, *After Dark* offers controls for customizing the screen-saving process. Once you've installed the software in your System Folder (or Control Panels folder if you're running System 7), you can decide how long you want your Mac to be idle before *After Dark* puts the screen to sleep. You can also determine whether you'd like sleep and no-sleep corners and where to position them on the screen. You activate and deactivate the screen saver simply by moving the cursor to a designated corner.

When a program presents a dialog box while the screen saver is activated, the screen wakes up and displays the dialog box. Password options control access to snoozing Macs, and a System feature prevents *After Dark* from engaging if it detects CPU-intensive activity, such as downloading files, printing documents, and backing up. Note that MIDI activity doesn't conform to the Apple serial standard and therefore does not stop *After Dark* from switching on.

Version 2.0's modules range from traditional screen savers such as *Bouncing Ball* and *Fade to the Jefferson Airplane*-inspired *Flying Toasters*, complete with the sound of flapping wings and an option of choosing light, medium, or dark toast.

Multimode lets you run several *After Dark* modules simultaneously. You can layer multiple modules, place them side by side, or overlap them. You can also personalize certain modules — for example, *Logo* displays scanned or drawn PICT-format graphics, *Messages* lets you type and display your own comments to the world at large, and *Slide Show* projects alphabetized color PICT documents. Regrettably, a handful of modules are available only in color.

If you find yourself tiring of toasters and fish (yes, there is an aquarium containing more-colorful and less-aggressive creatures than those featured in *Fifth Generation Systems'* \$39.95 *Pyro!*), read the section in the manual on programming your own modules. Nonprogrammers can enjoy the fruits of another's labor by checking out the local BBS for additional modules (try the *Monitors* library in *CompuServe's* Macintosh System Software Forum).

All Mac users should have a way to protect their screen, and *After Dark* offers more colorful eye-candy than any other screen saver (competitor *Pyro!* offers only 12 modules, compared with *After Dark's* 31). If you want to avoid the ghostly images of screen burn-in and you have a penchant for the beautiful and occasionally bizarre, check out *After Dark*.

Berkeley Systems, Inc., 1700 Shattuck Avenue, Berkeley, CA 94709; (415) 540-5535. Version 2.0. \$39.95.

— Christopher Breen



The amazing thing about *Amazing Paint* is the plethora of features it offers at a relatively low cost — \$79.95. The black-and-white program offers more than 75 features, many of which are patterned after those of more-expensive, high-end illustration programs. There isn't enough room to list them all, but the most noteworthy are multiple undos and redos limited only by memory; editable brush and shape patterns; and a slew of effects options, including slant, flip, mirror, trace, invert, and distort. The package also lets you print poster- or billboard-sized versions of documents.

The multiple undo function is a boon, because the fun of using a paint program has always been altering pictures to see what outrageous effects you can create.

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NEW ON THE MENU QUICK CLICKS

Amazing Paint supports some glitzy text functions: If you can stomach a 999-point plaid letter over a herringbone background, Amazing Paint won't stand in your way. The program also supports ATM and TrueType.

The only fly in the Amazing Paint ointment is a poorly written manual, an all-too-familiar occurrence these days but one that's unexpected from CE Software. We are firm believers in tutorials, especially when it comes to paint programs with lots of tools. If ever a program needed a tutorial, Amazing Paint does. But with only 45 typo-littered pages (6 of which are dedicated to Mac basics usually ignored in other manuals), the manual provides only a terse, cursory explanation of the program's many features.

On the other hand, the manual invites you to experiment and explore, albeit out of necessity. And what's most apparent about Amazing Paint is that the CE Software people had a great time developing the program. A sense of goofy fun pervades the entire package.

If you're looking for a powerful, inexpensive, *fun* paint program that gives you the most features for your money and runs even on a Mac 512K, Amazing Paint is for you.

CE Software, 1801 Industrial Circle, P.O. Box 65580, West Des Moines, IA 50265; (515) 224-1995. Version: 1.0.1. \$79.95.

— Ken Gruberman



BannerMania



BannerMania is a specialty graphics program designed for creating banners, bumper stickers, signs, posters, and T-shirt designs.

The program includes 19 custom outline fonts that let you enlarge your banner type without creating jaggies. And BannerMania type is BIG—a single letter can fill an 8.5-x-11-inch sheet of paper. If you don't find the fonts you want in BannerMania, you can import Adobe Type 1 fonts. Once you've entered your type, you can bend and twist it into arcs, pennants, and ribbons. The program supplies 24 ways to manipulate type and has more than 20 built-in special effects, such as shadows, perspective, and 3-D.

BannerMania's most fascinating feature, Transmogrify, sets the program spinning through an almost endless series of

variations based on a banner you've created. The program cycles through different fonts, colors, letter shapes, and layouts in quest of a better alternative. Your only problem will be making up your mind about which variation to choose.

A Preview window is BannerMania's handiest feature. After you type in a few lines of text for a banner, you can call up the Preview window for immediate feedback on exactly how the banner is going to look when printed. Even the page breaks are displayed, which is helpful if you want to take advantage of a print option that lets you skip the page breaks or print over them in one long, unbroken sheet.

You can print your BannerMania banners in black-and-white, or in color if you use an ImageWriter II with a color ribbon. The program also works with the LaserWriter and other sheetfed printers, but they don't give you the dramatic banner sizes that the ImageWriter produces.

The program's 36-page manual is as close to perfection as a manual can get. It's informative and uncondescending, although obviously written with first-time Mac users in mind. After reading the manual, I had no questions at all about *any* function of the program.

BannerMania's only shortcomings are that it can't import other graphics file formats and that it exports files only in 72-dpi PICT format.

These minor drawbacks aside, BannerMania is the fastest, easiest way imaginable to emblazon your world with logos, greetings, slogans, and other assorted words of wisdom and foolishness.

Broderbund Software, 17 Paul Drive, San Rafael, CA 94903; (415) 492-3200. Version 1.0. \$59.95.

— Ken Gruberman



One Shot Worksheet



One Shot Worksheet is a DA forms generator with sophisticated calculation capabilities. Unfortunately, the package's limited drawing tools and restrictions on the number of objects per page limit the variety and quality of the forms you can create.

One Shot organizes forms into workbooks that can contain up to 32 spreadsheet-style worksheet pages. You can design each worksheet by using a total of 100 items such as labels, data fields, and graphic objects. Although this may seem to be an

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adequate number, it's easy to reach the 100-item limit quickly. To mitigate this somewhat, One Shot lets you select ranges of cells to be considered as single objects.

The program provides more than 150 calculation functions for building equations for worksheet fields. Equations can link fields on different worksheets within the same workbook.

You can even use equations with graphics, which then work like buttons. Some calculation functions are rather esoteric, such as the one that returns the hyperbolic secant of a value, but most are the standard mathematical, statistical, trigonometric, financial, date, and time functions you find in spreadsheet programs.

You work with One Shot in User mode for data entry and in Layout mode for forms creation. As with other forms generators, One Shot doesn't function as a database program. Each worksheet stores only the information displayed on-screen, and forms are not layouts for multiple records.

Neither is One Shot a true spreadsheet program, despite its worksheet metaphor and calculation capabilities. For example, creating ranges of cells for simple spreadsheet operations is tedious, because One Shot doesn't let you enter text and numbers in the same range.

One Shot is good at creating basic forms teamed with useful behind-the-scenes data calculations. It won't suit your needs, however, if you want to create fancy, or even attractive, forms. It supplies only basic drawing tools, and a lot of effort is required to make a really good-looking form. If you want a drop-shadowed rectangle, for example, you have to draw a white rectangle on top of a black one and use the offset for the shadow. And with no option for creating rows of check boxes, you have to draw individual squares. Consequently, you soon reach the 100-item per page limit.

Perhaps that's why the program's sample files are not exactly aesthetically pleasing, although some are practical and show off the program's calculation functions. The documentation isn't much to look at either, and its contents fall far short of what's needed to describe the program's potential. Overall, One Shot is a good start, but it needs improvement.

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The Mac offers a lot more than just pretty pictures. A host of audio products also makes it the ideal digital sound machine.

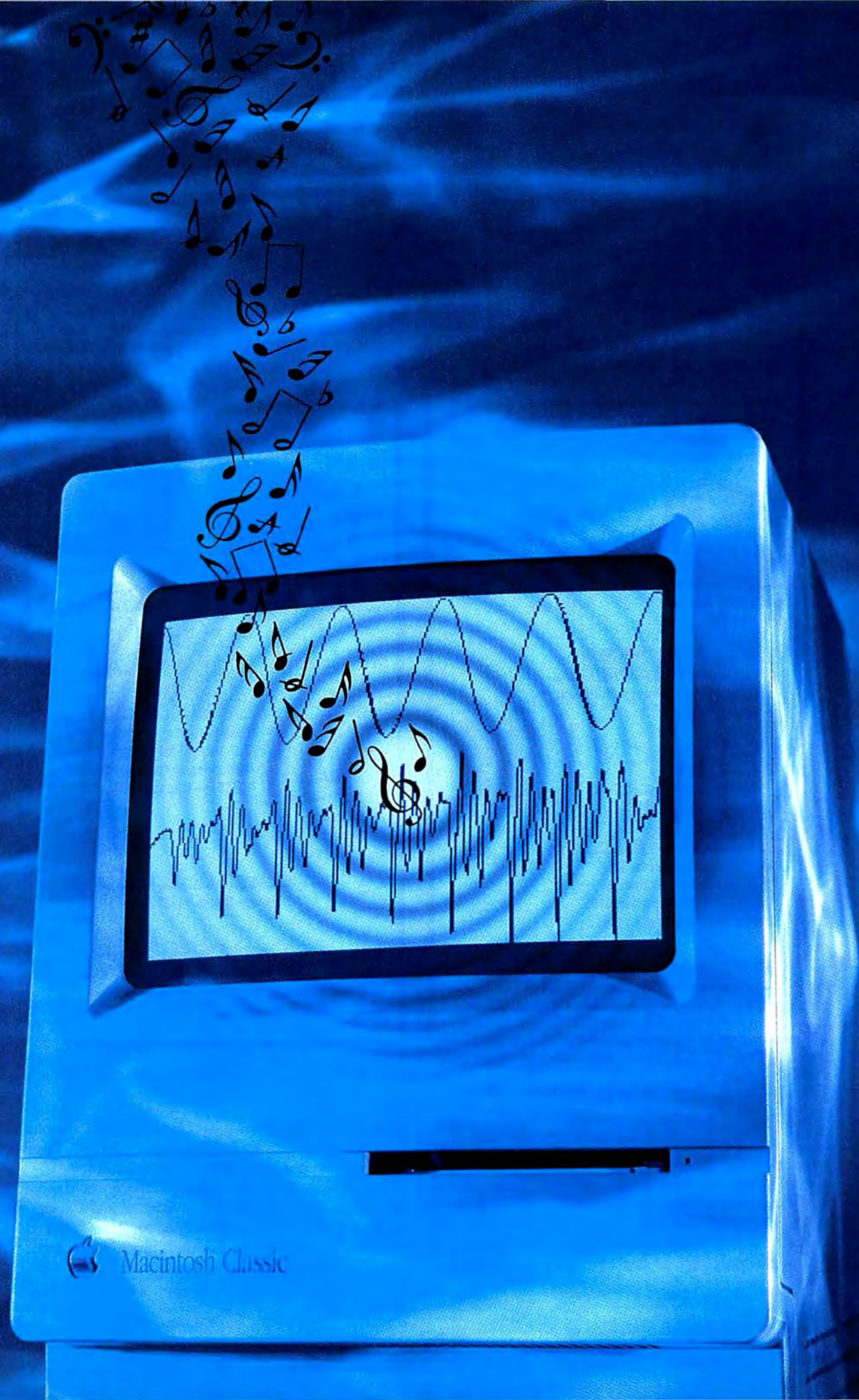


BY PAUL D. LEHRMAN AND TIM TULLY



Audio is so integral a part of multimedia that most users would recognize its importance only by its absence. Although the video world is currently confronting the difficulties of digitizing, compressing, and storing still images, the audio world has spent the past six years undergoing its own digital revolution and has now settled in to watch the costs of memory and media go down.

Business presentations, training materials, and professional recordings have all benefitted from the ease with which the Mac handles every aspect of audioproduction—from generating synthesized and sampled sound to recording, editing, storing, and synchronizing it to the various visual media. To a great extent, the audio side is now ready for multimedia and is just waiting for digital video to catch up.



Macintosh Classic

The Good, the Bad, and the Superbad

So you want to be a rock-and-roll star, and you have visions of letting your Mac replace the man with the big cigar? Here are three different levels of studio you can build around a Mac and their cost breakdowns. Each includes one MIDI instrument/controller external

to the Mac on which you actually play the music you record. (Of course, if you're interested only in editing and playing back prerecorded MIDI music, such as Passport's MIDI hits, you won't need one of these.) You also need some sort of amplified speakers or a set of

Total cost (excluding Mac): \$1,922.95

Roland's Sound Canvas provides excellent sound quality and very good multitimbral capability for a good price. Unfortunately, it has no keyboard, so go for an inexpensive MIDI keyboard that also has its own sounds. Pro-level digital audio doesn't really fly without a NuBus card, but with the MacRecorder, you can go the 8-bit route. Beyond's low price gives it the nod here.



Mac Classic with hard drive (\$1,499)



Opcode MIDI Translator (\$59.95)



Roland Sound Canvas multitimbral synthesizer (\$795)



Farallon MacRecorder (\$249) and Farallon's SoundEdit (free with the MacRecorder; \$195 stand-alone if you've got a Mac IIx or LC)



Dr. T's Beyond (\$319)



Inexpensive multitimbral MIDI keyboard (about \$500)

Total cost (excluding Mac): \$5,534

Take the IIfx over the considerably less expensive IIx. Its three expansion slots and greater speed give you lots more sound-generating and digital-audio power. With a combination of the Audiomedia board and Deck, you can record digital audio and integrate it with sequences created in the dedicated sequencer.



Mac IIfx (\$5,969)



Digidesign SampleCell with 8 megabytes of RAM (\$2,315)



Passport's Master Tracks Pro 4.5, Mark of the Unicorn's Performer, or Opcode's Vision (\$495) — take your pick



Digidesign Audiomedia (\$995) and Deck (\$349)



Opcode Studio 3 (\$380)



External keyboard sampler or synthesizer (about \$1,000)

The Mac and MIDI

The Mac handles sound in two basic ways. The more straightforward (although the later to mature) is digital audio. Sound goes from a microphone to the computer, where the computer digitizes it, much as a scanner digitizes a picture. Once it's in the Mac, as with any digital data, you can edit it in a variety of ways — usually more quickly and easily than on analog media; store it; and with total fidelity,

convert it back to the analog domain for amplification and playback. This is the basic technology of the now-familiar CD (compact disc) and of DAT (digital audiotape).

The other side of the audio Macintosh is the MIDI sequencer. Even though it has been around longer, the sequencer is still somewhat mysterious even to the computer-literate, although the multimedia movement is changing this quickly.

headphones with which to hear the music.

Each system includes a sequencer you can use to record, edit, and play back the music you perform on the MIDI controller. And each system allows for some form of digital audio.

Total cost (excluding Mac): \$15,020

The IIx is (for now) Apple's fastest. Its six slots, loaded as described, give you pro-level audio and a virtual orchestra's worth of instrumental sounds. You'll never see the sun again.



Mac IIx (\$8,069) with one MacProteus card (\$895) installed



Opcode's Studio Vision (\$995) (also provides digital-audio recording, editing, and playback)



Mark of the Unicorn MIDI Time Piece (\$495)



Three Digidesign SampleCells with 8 megabytes of RAM each (\$7,350 total)



Digidesign Sound Tools system (\$3,285), Sound Designer II (comes with the Sound Tools system), and Sound Designer II SC (comes with the SampleCell)



External keyboard sampler or synthesizer (\$2,000)

Sequencers

Sequencing is the less expensive approach to creating sophisticated sounds on your Mac. The term *sequencer* comes from a function of early synthesizers. The first sequencers appeared in the late '60s, when primitive analog synthesis systems included modules for programming a series, or sequence, of events that could be triggered and repeated. In the '70s, digital sequencers appeared that could

memorize notes played on a keyboard and spit them back out with perfectly duplicated tempo, dynamics, and phrasing.

In 1983 MIDI (musical-instrument digital interface) appeared, giving synthesizer and computer manufacturers a common language and protocol that let all their equipment work together. Instead of being limited to one manufacturer's equipment, sequencers could now work universally. Getting a computer to talk MIDI was easy, and sequencing programs soon appeared. Almost overnight, editing and manipulating MIDI sequences took a quantum leap in user friendliness. With a Mac as the front end of your synthesizer setup, you now had a full screen (instead of a synthesizer's small LCD panel) and a keyboard and a mouse (instead of a few cryptic controls) to work with. Plus you could use your Macintosh's printers and networking capabilities, floppy- and hard-disk storage options, and all the other advantages of a general-purpose computer.

With a healthy standard and a computer that looked and felt right in a musical environment, the stage was set. Software sequencers that took advantage of the Mac's superior interface and processing power soon proliferated. Today, several competing sequencers are available that can record musical performances with expressiveness and subtlety and play them back on any number of sophisticated MIDI synthesizers, samplers, and drum machines. Better, perhaps, they let you edit the nuances that your instrumental technique lacks into a recorded sequence, just as good composers might score a piece on paper that they might not have the expertise to perform.

In addition to editing musical fine points such as phrasing, intonation, and articulation, you can also edit a sequencer composition on a macro scale. All told, today's Macintosh sequencers let you arrange and orchestrate a piece and hear each part and section performed as soon as you've written it. Some programs, such as Opcode Systems' Vision, can even nudge you out of the creative doldrums by generating new melodies extrapolated from the ones you record.

It's no exaggeration to say that contemporary sequencers serve as cocomposer, conductor, band, and recording studio, and it's no secret why they're ubiquitous in composing circles as well as in production studios. And although sequencers have grown in sophistication, they've also become much simpler to use for those with less-demanding requirements.

Three sequencers currently dominate the professional market: Mark of the Unicorn's Performer 3.61, Opcode Systems' Vision 1.2, and Passport Designs' Master Tracks Pro 4.5, each priced at \$495. A newcomer at the same price is Cubase 1.8, Steinberg/Jones' direct port of the heralded German sequencer for Atari computers. In addition, Opcode and Passport, respectively, offer EZ Vision (\$149) and Trax 2.0 (\$99), stripped-down versions of their professional programs, for the hobby and multimedia markets. Occupying a \$319 price niche in between is the relatively new package

Digital Audio

Beyond 2.0, from Dr. T's Music Software. On the horizon, is Dynaware's Ballade-Macintosh, an inexpensive sequencer that's already available for PCs and that has a colorful recording-console-style interface.

When they first appeared, the major players took very different approaches, but over the years, they've profited from each others' experiences and have, along with the newcomers, incorporated elements of the others. An inevitable overlap has occurred, and current Mac sequencers now share so many similar features and functions that differentiating among them is difficult — choosing one is largely a matter of taste and feel.

A sequencer is connected to a MIDI instrument via the Mac's modem and/or printer ports and a dedicated interface box. Playing the instrument sends out MIDI information describing the start time, pitch, duration, volume, and other parameters of the notes you play. The sequencer, largely modeled after multitrack tape decks, displays on-screen shuttle controls such as Play, Stop, Fast Forward, Rewind, and Record. Click on the Record button, and the sequencer starts recording the instrument's MIDI data. Click on the Play button, and it sends the MIDI data back to the instrument, replaying your performance more or less exactly.

Once you've recorded the first performance on one of the sequencer's tracks (as with a multitrack tape deck), you can play it back while you record a second, independent track; then a third; and so on until an entire composition is built up. If the first track is intended to be the piano part, for example, on playback it's sent to an instrument programmed to sound like a piano. Each subsequent track typically consists of a part for an individual instrument, so as you record more and more tracks, you may need more than one instrument to

perform all the parts at once. Fortunately, you can now buy so-called multitimbral synthesizers that can simulate several different instruments simultaneously, which lets you create a reasonably full ensemble with just a single box.

Connect the Mac to the requisite synthesizers and samplers programmed to play the sounds you want, and you've got an ensemble limited only by your budget. Different instrumental sounds within a synthesizer are normally addressed by numerical MIDI commands known as program changes, but all the pro-level programs go one better than this by letting you label each track with the name of the instrument sound you assign to it. Vision has even been hot-linked to Opcode's universal synthesizer librarian program, Galaxy, and automatically displays new sounds that you send to an instrument with Galaxy.

The sequencer helps you record by letting you slow the tempo to allow a nonvirtuoso to play a part and then speed it up at playback. You can also record in *step time*, in which you tell the sequencer what the duration of the next note or notes will be and then play them one at a time at your own pace until you need another duration. You then adjust the duration and do it again.

Sequencers also improve on their tape-deck analogues in the controls department. The shuttle controls are instantaneous and exact. Advanced control functions include turning a metronome on and off, automatic punch-in, auto-rewind, and tempo control. All the programs have some manner of loop function that plays a given track or section of a track repeatedly, but Performer probably has the most elaborate, allowing both record and play loops of programmable iteration and even complex, nested loops at any point in any track (see Figure 1).

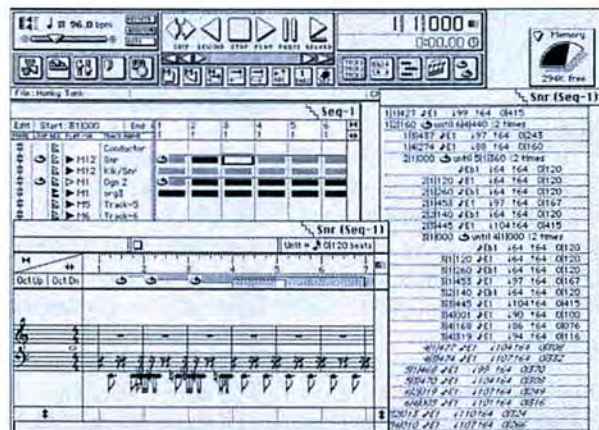


Figure 1: Mark of the Unicorn's Performer has a host of controls; a track window for easy editing; and the ability to do complex nested loops, shown here in the track, notation, and event-list windows.

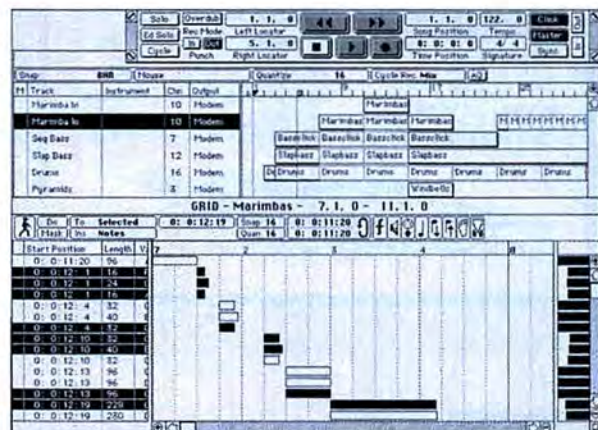


Figure 2: Newcomer Cubase, from Steinberg/Jones, combines an event list, a graphic note editor, and a graphic controller editor (far right) in a single window. As with Performer, you can select discontinuous events.

Editing

Because the recorded "performances" are actually digital data, editing your recorded tracks is also faster and more precise than with tape. One important sequencer function is to *quantize* recorded notes — that is, move them so they start or end on the nearest beat, even if the timing of the original performance was sloppy. Some sequencers also have a Humanize feature, which lets you do just the opposite: take a precise performance (or a step-time generated sequence) and introduce a tiny bit of randomness to make it sound more natural.

In any of these programs, you can adjust how close to the beat the program moves notes, which notes it moves, and several other parameters. One of Master Tracks Pro 4.5's best features is its Change filter, which lets you easily specify certain beats in a measure; it then applies quantizing or other operations only to notes that are to fall on those beats.

The way individual notes are represented and edited used to be a principal difference among the sequencers. Passport was the first of the Big Three to use graphic note editing, in which notes are displayed as horizontal rectangles that scroll by on a "piano roll" grid as the sequence plays. It's possible for you to change a note's pitch, attack time, and duration by clicking and dragging. Mark of the Unicorn, on the other hand, developed the alphanumeric *event list* of notes (see Figure 1), in which note parameters such as attack time, duration, and pitch are edited with menu commands and keyboard input. The piano-roll approach tends to be more direct and intuitive, whereas the list method boasts numerical precision.

All the packages now have both kinds of display, with

only a few small differences among packages. Only Performer and Cubase (see Figure 2), for example, let you select discontinuous groups of notes for editing, and Performer offers a unique notation window, displaying an editable track in standard music notation.

With any of these sequencers, you can splice parts together; copy and paste single notes, tracks, groups of tracks, or entire songs; transpose, invert, or reverse notes or phrases; and send them to different instruments — all with a few mouse moves. The piano-roll grid makes note editing simple and intuitive, although mixing and matching large sections of music can be unwieldy. Master Tracks Pro 4.5 long held the prize for this latter task, offering a track-editing window in which bar-sized chunks of any number of tracks could be cut and pasted with amazingly little fuss (see Figure 3). Recent versions of Performer have adopted a similar approach, however, and Beyond, Cubase, and Vision cover these sorts of note-editing functions by allowing you to display an entire subsection of a piece as a small rectangle and then letting you drag, overlap, paste, and otherwise manipulate several subsections to build up a composition.

One of the newer features being offered is a moving on-screen fader. Beyond, Performer, and Vision display recording-console-style faders that affect volume, pitch bend, timbre, and a bushel of other sound qualities. As a sequence plays, you can record any changes you make to a fader, and the changes play back dynamically while the fader moves on-screen for visual feedback. To make such changes in Master Tracks Pro 4.5, you must use the mouse to draw a line in a controller window to represent the change you want. Cubase has a similar feature.

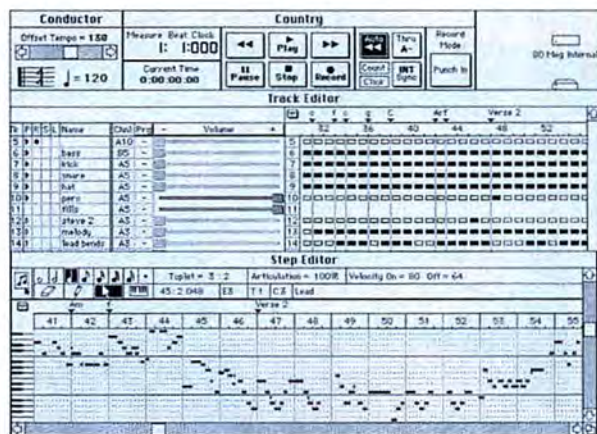


Figure 3: Part of a sequencer's job is to make music easy to edit. Passport Designs' Master Tracks Pro 4.5's track-editing window lets you cut, copy, and paste large blocks of music with lots of visual feedback.

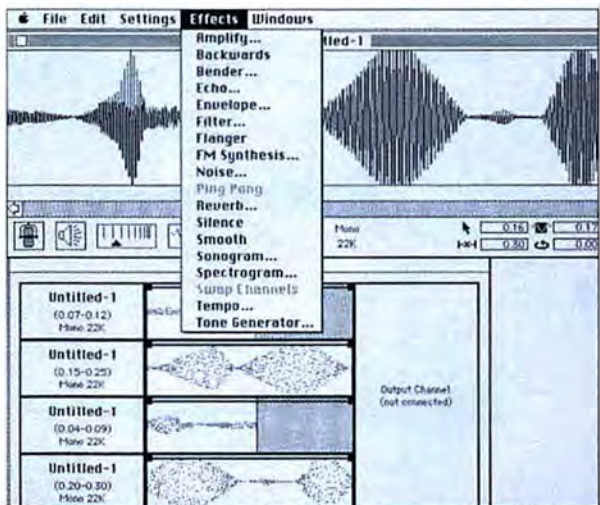


Figure 4: Farallon Computing's inexpensive SoundEdit software, which until recently was available only as part of the MacRecorder package, has a wealth of editing, mixing, and modifying functions for 8-bit RAM-based sound.

Digital Audio

Synchronizing to Video

All the programs except the junior versions (EZ Vision and Trax) fully support video synchronization. They can lock their timing to visual media via SMPTE (Society of Motion Picture and Television Engineers) and MIDI time codes — a scheme in which a signal recorded on videotape sends timing data to the sequencer.

All these sequencers are mature, full-featured programs that (with the exception of Beyond) have been performing successfully for at least a few years, but there are distinctions. Performer displays tracks in standard notation, and you can use it with as many as four of Mark of the Unicorn's MIDI Time Pieces to support as many as 512 MIDI channels. Vision has more features than any of the others, including the ability to play multiple simultaneous sequences with different time signatures and tempi and a sophisticated instrument-layering and -channelizing feature that makes the most of a multi-instrument setup. Master Tracks Pro 4.5, although less loaded with features, is the easiest to learn and use and requires the fewest references to the manual; it's also the only one that's not copy-protected. Cubase has a Selection filter that lets you select a phrase and use the placement of its notes to align the rhythm of other notes to create custom-designed grooves. Beyond is well designed and is comparable to Master Tracks Pro 4.5, although its interface isn't always as elegant. It's less feature-rich than Vision or Performer, but it costs nearly \$200 less than its competition, so it's worth considering.

Choosing *any* of these sequencers will provide you with a useful musical tool, and picking one over another is largely a matter of personal taste. As with any musical instrument, how a sequencer feels to you is probably at least as important as its feature set. It's hard to be creative if

you're constantly fighting with your applications, so it's well worth your time to do as much comparison shopping as you can before you write that check.

Digital Audio

Although MIDI lets a computer control external sound-producing devices, the Mac itself can handle "real" sound. The Mac's sound capabilities have come a long way since novelties such as the Talking Moose, and today Macs are producing high-quality audio for a wide variety of uses, including music in HyperCard stacks; multimedia presentations with speech, sound effects, and music; sound editing for professional film and video production; and even CD recording and mastering.

The fidelity of sound when it is recorded, or *sampled*, depends on two factors in the digitizing process: the resolution and the sampling rate. The *resolution*, or the number of bits used for each sample, is responsible for the difference between the loudest and the softest sounds that can be recorded and played back. CDs and other professional digital-audio formats normally use 16-bit resolution. The internal sound hardware in all Macs uses 8-bit resolution, which provides about the same dynamic range as an inexpensive cassette recorder. To handle 16-bit sounds, the Mac needs additional hardware.

The *sampling rate* — how many times per second the sound is digitized — determines the highest frequency (*pitch*, in musical terms) the system can record. The upper frequency limit of a sampling system is equal to slightly less than half the system's sampling rate. CDs use a rate of 44.1 kilohertz, so their top frequency is about 20 kilohertz, which is the upper limit of human hearing. Other sampling systems use lower rates, such as 22 kilohertz, which gives

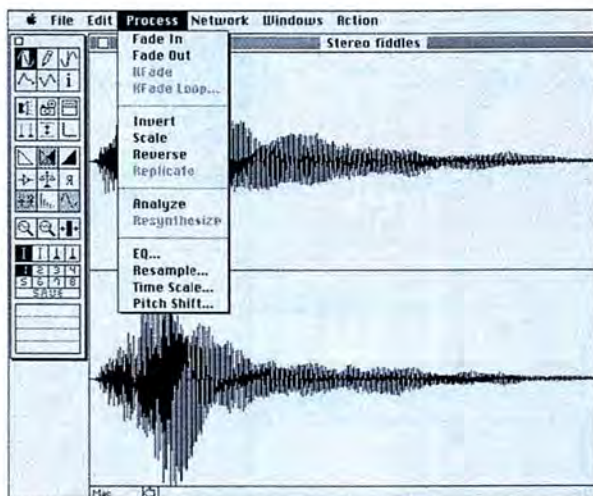


Figure 5: The next major upgrade of Passport Designs' Alchemy, shown here in a prerelease version, provides highly sophisticated editing capabilities for 8- or 16-bit sounds in RAM or on-disk.

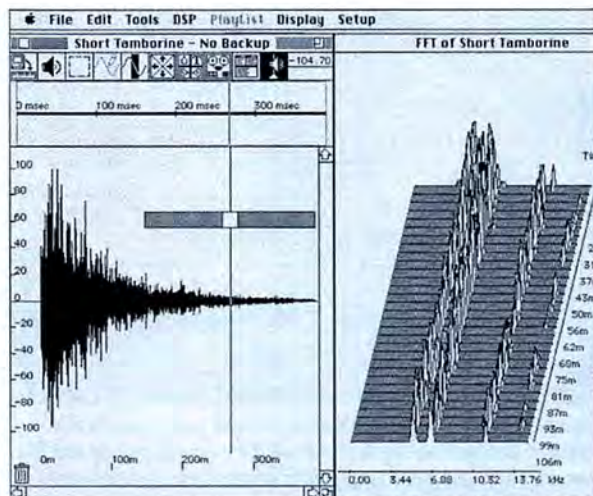


Figure 6: For professional-quality digital audio, Digidesign's Sound Designer II, the front end of the Sound Tools system, provides spectral analysis and extensive editing functions.

the quality of a good FM table radio, or even 7 kilohertz, which is telephone quality. The highest sampling rate the Mac can handle by itself is 22 kilohertz, but additional hardware can help.

Sound takes up a lot of room in memory, but the amount of room a sound requires is determined by its sampling rate and resolution. One minute of 8-bit 22-kilohertz sound uses up about 1,200K. A minute of 16-bit 44-kilohertz sound takes up four times as much space: around 5 megabytes. For stereo, double everything. Generally (but not always), 8-bit sound is recorded and played back from RAM, whereas 16-bit sound, because of its storage requirements, is always recorded and played back directly from a fast hard disk.

Mac Audio

From the beginning, all Macs have been capable of playing at least two channels of 8-bit 22-kilohertz sampled sound from RAM. Until recently, however, Apple provided no way of getting sound into the computer, a vacuum that was well filled by Farallon's MacRecorder. More recently, Articulate Systems has introduced three sound tools: Voice Record, a software-only recording and editing package; Voice Impact, a simple digitizer with built-in gain control plus Voice Record; and Voice Impact Pro, a more advanced digitizer with Voice Record, on-board DSP, compression, and additional audio input jacks for external sources (see "Sound Investments," September '91, page 46). The Mac LC and the Mac IIsi come with their own sound-digitizing microphones, but the technology is essentially the same as the MacRecorder's, and for manipulating the sounds, Farallon's SoundEdit software is still the standard.

The MacRecorder is an inexpensive audio digitizer with a built-in microphone that plugs in to one of the Mac's serial

ports. The microphone is good enough for voice quality, but it also has a jack for a line-level input, which gives much better fidelity. (Farallon's new Voice Digitizer, a lower-cost version without the line input, gives earlier Macs the same voice-recording capability as newer ones, but it is unsuitable for music.)

The MacRecorder's powerful and intuitive SoundEdit recording and editing program (see Figure 4) can splice, filter, compress, reverse, reverberate, or impose a pitch envelope on a sound file. In addition, it can mix as many as four files into one, in mono or stereo, and speed up or slow down a sound without changing its pitch. It also includes HyperCard stacks for recording, editing, and playing back sounds and giving other stacks the same capabilities.

Since the Mac II, all Macs have had a chip that can play four channels of 8-bit sound, but the System software to allow this was not available until Apple included Sound Manager in System 6.0.7. (The Mac LC doesn't have the four-voice chip, but it emulates it with software.)

One of the first applications to take advantage of Sound Manager was Sound Exciter, from Passport Designs. Sound Exciter works in conjunction with MIDI Manager, the recent addition to System software that allows internal routing of MIDI data. It lets notes from a sequencer or an external MIDI source such as a keyboard play up to four simultaneous sounds from the computer's RAM. As with a MIDI-controlled sampler, the sounds can be played over a range of pitches and volumes. Sound Exciter comes with its own library of instruments and "orchestras," and it can also play sounds recorded with the MacRecorder.

Normally, 8-bit sound files are stored as Sound documents or as snd resources within documents and are played from RAM. However, Apple has recently introduced a

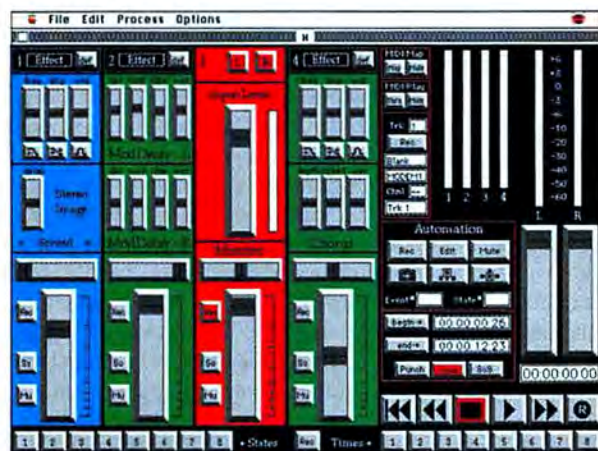


Figure 7: Digidesign's Deck, combined with the Sound Tools system or the Audiomedia board, lets you create four-channel CD-quality recordings, with effects, automated mixing, and MIDI-file recording and playback.

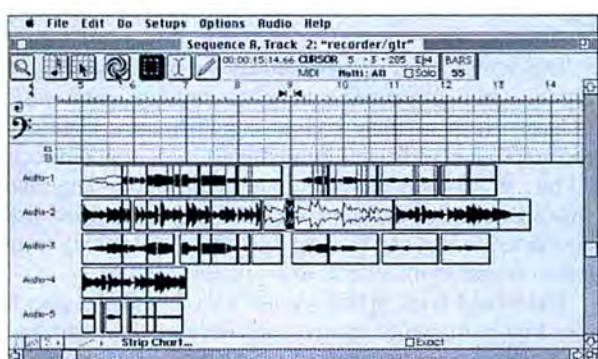


Figure 8: Opcode Systems' Studio Vision provides high-end integration of 16-bit digital sound and MIDI files. It's a feature-laden 32-channel sequencer combined with stereo playback of 16 "virtual" tracks of CD-quality audio.

Digital Audio

brand-new scheme: 8-bit AIFF files. AIFF (Audio Interchange File Format) is an Apple-approved universal sound format that can handle mono or stereo sound at any resolution or sampling rate. Most significantly, you can play an AIFF file directly from a hard disk without first loading it into RAM, which means that the amount of computer memory available is no longer a limiting factor in the length of sounds that can be played.

Passport Designs is about to release the first two products to use this format: AudioTrax and a new version of Alchemy (see Figure 5). AudioTrax is a version of Passport's Trax that allows two separate channels of audio to be recorded and played back in conjunction with a MIDI sequence. Alchemy is a professional-level sample-editing program, and Passport has said that the next major upgrade will turn the system into a disk-based package, in contrast to the current RAM-based version. Additional features will include sound editing and playback of 8- and 16-bit audio files, so Alchemy will be able to perform sophisticated operations on the sounds recorded with AudioTrax. The combination of the two promises a lot of power at a reasonable price.

Professional Audio

Sixteen-bit audio is professional quality. Being able to record, manipulate, and spit out CD-quality sound with a personal computer is awesome. It's also not as expensive as you might think.

The first product that let the Mac handle 16-bit audio was Digidesign's Sound Accelerator card for the SE and Mac II. Originally a playback-only system used in conjunction with Digidesign's MIDI sample-editing software, Sound Designer, Sound Accelerator evolved into the Sound Tools system when Digidesign introduced a companion outboard digitizing box, originally called the Ad In, for recording audio.

The Sound Tools system is today the most widely used digital hard-disk recording and editing system in the music industry. It is used by CD-mastering houses, classical-record producers, dance-music mixers, film-sound-effects editors, multimedia producers, and audio studios large and small. Because its capacity is limited only by the hard disk connected to it, it can be used to work on everything from three-second sound effects to 70-minute albums.

The Sound Tools system comes with Sound Designer II (see Figure 6), which lets you precisely modify, edit, and rearrange the hard-disk audio. Like Alchemy and SoundEdit, Sound Designer II allows cutting, pasting, and merging of mono or stereo sound files; offers several types of equalization; and has the ability to change a sound's tempo and pitch independently. Several input modules for the system are available: The Analog Interface provides analog inputs and outputs; DAT I/O allows direct input from digital sources, including DAT decks, CD players with digital outputs, and digital mixers and processors; and Pro I/O

features balanced analog audio inputs with high-performance filters for maximum quality.

The Audiomedia package, a junior version of the Sound Tools system for the Mac II family, includes input and output functions on the same card. Despite the low price — one-third that of a basic Sound Tools system — its fidelity is very nearly as good and it is ideally suited for multimedia applications. The major differences between the two are that the Audiomedia board does not have the high-end alternative input devices available for the Sound Tools system and that the version of the Sound Designer II software that comes with the Audiomedia board (called, confusingly enough, Audiomedia) does not allow sounds recorded with the system to be exchanged with MIDI-based external samplers (if you need this feature, it's provided by another Digidesign program, Sound Designer II SK).

To fully exploit its hard-disk audio technology, Digidesign also developed Deck (see Figure 7). This inexpensive software package allows a Mac equipped with the Sound Tools system or the Audiomedia board to become a fully functional four-track digital recording studio, with automated mixing, equalization, and effects on each channel. Files created with Deck can be edited further with Sound Designer II or Alchemy, and files created with those programs can be imported as tracks within Deck.

In addition, Deck includes a simple MIDI sequencer that can record and play back MIDI tracks at the same time as it records and plays audio and can also play MIDI files created with other sequencers. The limitations on Deck are that you can record only one track at a time with a Sound Tools system — or two at a time with an Audiomedia card — and that, because you are dealing with four tracks of audio, storage requirements are doubled.

Mixing MIDI and Audio

Musicians who work with MIDI and sequencers also have a need for real sounds. Certain types of audio, such as human voices, hot sax solos, and complex sound effects, don't lend themselves well to MIDI control. The traditional way around this limitation and a method of integrating those sounds with MIDI-controlled instrumental tracks is to use tape for those sounds and to put a timing signal such as SMPTE time code onto another track of that tape, which in turn controls the MIDI sequencer. But as we've seen, sequencers offer far more flexibility than tape for arranging and composing. To have the same power over audio that sequencers give us over MIDI compositions has long been a dream of musicians who work with computers. Finally, the technology is here that lets us move, stretch, and otherwise edit recorded sound without destroying it.

Although Deck is primarily a digital-audio recorder/player, it has some MIDI capabilities. So does Q-Sheet A/V, an earlier Digidesign program used primarily by audio editors working with video. AudioTrax, as we said, integrates MIDI with 8-bit audio. But for sound quality and

elegance of interface, Opcode's Studio Vision tops the list.

Studio Vision (see Figure 8) extends the capabilities of Opcode's sequencer, Vision, giving it the ability to record, edit, and play back digital audio within a sequence, using Digidesign's Sound Tools or Audiomedia hardware. The program displays both MIDI and digital audio graphically, and it lets you move audio around in time, cutting and pasting it as easily as you can MIDI data. Up to 16 tracks of audio — mono or stereo — can be included in a sequence, but only two (or one stereo) can actually play at a time. This lets you, for example, select individual notes or phrases in multiple takes of a musical line and create a new take out of them. Or you can adjust the timings of several sound effects, each on its own track and each, if you like, in its own color. Individual audio "events" can be faded or panned, just as if they're MIDI tracks.


When you edit audio in Studio Vision, you actually only move "pointers" — the recordings themselves are not changed, which makes the program extremely fast. The Strip Silence feature automatically deletes silent sections of files, thus saving disk space.

The program hot-links into Sound Designer II: Select a portion of an audio track and choose Edit Soundfile, and Sound Designer II automatically launches, with the selected audio already loaded. When you've finished editing, the new audio is in place in the Studio Vision sequence. The

program is also file-compatible with Audiomedia and Alchemy.

Studio Vision is not going to be alone for long: Mark of the Unicorn has announced a combination hard-disk recorder and sequencer, also using the Digidesign hardware, called Digital Performer. And as the hardware continues to get more sophisticated and cheaper, other manufacturers are waiting in the wings too.

There are plenty more audio products available for the Macintosh. Sonic Solutions, a company that grew out of Lucasfilm, makes high-end CD-mastering and -editing systems, including No Noise, which digitally analyzes and eliminates noise to make great recordings out of otherwise unsalvageable tracks. Digital Dynamics, Symetrix, and New England Digital use the Macintosh as the central controller for their megabuck multitrack digital-recording systems.

On the other end, desktop-multimedia applications such as MacroMind Director have hooks for playing back MIDI sequences and audio files in sync with visuals. So don't forget as you're putting together all those pretty pictures — the Mac is a great-sounding machine too. 

Paul D. Lehrman and Tim Tully comprise Bi-Coastal MIDI Consultants, providing direction, implementation, and production services in Mac-assisted multimedia, from Oakland to Boston.

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Voice Impact Pro, \$299
Voice Record, \$79

Digidesign, Inc.

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Menlo Park, CA 94025
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Deck 1.03, \$349
MacProteus, \$895
SampleCell, \$1,995 (without RAM)
Sound Tools, \$3,285

Dr. T's Music Software, Inc.

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(617) 455-1454
Beyond 2.0, \$319

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(415) 596-9100
MacRecorder/SoundEdit, \$249
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222 Third Street
Cambridge, MA 02142
(617) 576-2760
MIDI Time Piece, \$495
Performer 3.61, \$495

Opcode Systems, Inc.

1024 Hamilton Court
Menlo Park, CA 94025
(415) 369-8131
EZ Vision, \$149
MIDI Translator, \$59.95
Studio 3, \$380
Studio Vision 1.21, \$995
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625 Miramontes Street
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(415) 726-0280
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Sound Exciter, \$79.95
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Los Angeles, CA 90040
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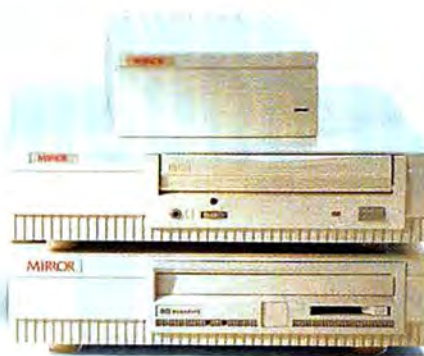
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Sensible Spreadsheets

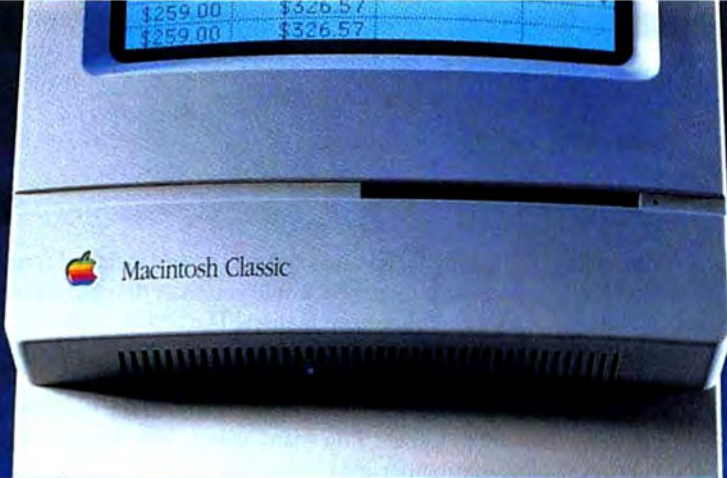
*When considering
a spreadsheet
program, don't
overlook the
reasonably
priced alternatives.*

●
BY
SHARON
ZARDETTO AKER

Excel and WingZ are the Mac's top-of-the-line spreadsheet programs, and the IIfx is the top-of-the-line Mac CPU. But not everyone needs the power of a IIfx or a killer spreadsheet program such as Excel. If your spreadsheet needs are not so much number crunching as number *munching*, there is life before Excel and WingZ. Here's a look at five of the available alternatives: BiPlane, from Night Diamonds Software; DeskCalc, from Zedcor; Full Impact (part of SmartBundle), from T/Maker Co.; MacCalc, from Bravo Technologies; and Works, from Microsoft.

Why does anyone need a spreadsheet program? What do you do with it? Work on a budget. Keep a checkbook. Plan simple financial strategies such as figuring the return on an IRA or other long-term investment. Find out whether a four-year car loan at 6 percent is better than a five-year loan at 5 percent. Keep track of medical bills and insurance claims. There are also some tasks that have to do with lists and numbers but not money, such as everyone's standing in your bowling league.

PHOTOGRAPHY: STEVEN UNDERWOOD



Budget Spreadsheets

Each of the spreadsheet programs in this roundup was evaluated in three areas: interface, functionality, and presentation capabilities. The interface evaluation included not just the overall look and feel of the product (most spreadsheet programs look and feel pretty much alike) but also all the ways you interact with the program when you enter and view information. Features such as split windows, viewing formulas rather than results, a built-in help function, and the ability to move or duplicate cell information without using the Clipboard all contributed to the interface appraisal. Pasting options were another important interface feature: Could you paste cells that had been cut or copied,

Item	Description	Quantity	Unit Price	Extension
1	24" 2-light bar	2	\$79.00	\$158.00
2	Oak swing door medicine cabinet	2	160.00	320.00
3	Solid Oak 3/4" Brass pull chain toilet kit	2	289.00	578.00
4	30" Oak vanity	1	229.00	229.00
5	36" Oak vanity	1	249.00	249.00
6	30" Oak towel bar	3	14.00	42.00
7	Oak soap holder	2	7.00	14.00
8	Oak 3 hook wall mount coat rack	2	7.50	15.00
9	Elongated Oak toilet seat	2	41.49	82.98
10	Oak toilet paper holder	4	10.00	40.00
11	Brass faucet	2	119.95	239.90
Materials Subtotal				1,967.88
12	Hourly labor charges	45	75	3,375.00
6% Sales tax				118.07
Grand Total				\$5,460.95

Figure 1: BiPlane is an outstanding value in spreadsheet programs, offering a 16,384-x-512-cell spreadsheet with 102 functions for less than \$60. Although BiPlane lets you define fonts and sizes for the spreadsheet itself, the entry bar is an eye-straining 9-point Geneva.

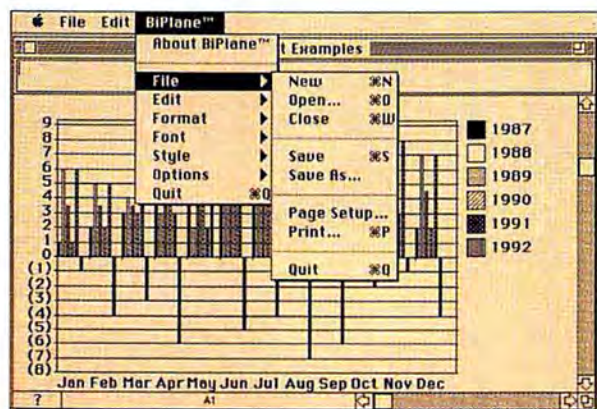


Figure 2: BiPlane's DA uses a hierarchical menu for all its commands, which is a bit less convenient than the single menu bar that DeskCalc uses. (One of the many chart types is shown in the window.)

using only their values (instead of any included formulas), and more importantly, could you paste the cells and reverse their row/column orientation? The ability to protect certain cells from being changed, hide cell contents, and add cell notes were pluses in this category.

The functionality category included the maximum size of a spreadsheet, how many sheets could be open at a time, and the number and kind of functions. The sheer number of functions didn't really matter here, provided that a core of the most useful ones was available. (Naturally, the larger the number, the more likely it was that useful ones were included.) Along with the standard spreadsheet-program functions (Sum, If, and so on), were there enough financial functions to do basic financial planning? Could the functions handle strings of text ("if cell A1 is 'yes' . . .")? Was there a lookup function so you could access tables of information? And, to make itself useful for all sorts of small jobs, could the spreadsheet program sort selected areas?

The presentation category included how things looked on-screen and in printouts. Every spreadsheet program supplies basic number-formatting capabilities (to specific decimal places or as currency or percentage) and lets you turn gridlines on and off, but the looks of a spreadsheet are also affected by added graphics and text formatting for individual cells and cell borders. Charting capabilities were a plus too. Being able to set up headers, footers, and page numbers for printouts also went into this category.

BiPlane

BiPlane was previously available as a shareware product. The first commercial version comes as a stand-alone application (see Figure 1) as well as a full-featured DA (see Figure 2). BiPlane lacks a lot of little features that would make it easier to work with. You can't split the window (but you can freeze the row and column titles), there are no pasting options, the DA version lacks handy in-window menus, and no cell notes are available. It does have a help feature and the ability to hide and protect cells.

BiPlane's biggest interface flaws are slow performance and unusual screen reactions during some basic operations. Copying a single number through 50 rows, for instance, took about six seconds on an 8-megabyte IIcx (compared with less than a second with the other spreadsheet programs). During this process, the selected cells flashed between black and white in an undulating pattern. Another minor flaw is BiPlane's erratic scrolling: If you drag the scroll boxes to their extreme positions to see the end of the spreadsheet, you can reach only column 23 and row 134—to go further, you have to use the Display Cell command, the scroll arrows, or a keyboard option for moving from cell to cell (with more than 16,000 rows, that takes a *long* time).

For its price and considering that it also works as a DA, BiPlane has an amazing number of functions: 102. They include everything you need in a 16,384-x-512-cell worksheet. You can open multiple sheets in the application

but not in the DA. BiPlane not only handles strings inside a formula but it also provides many string-manipulation functions. Extra functions include Playback and Picture, which incorporate sound and graphics, respectively, into a spreadsheet. (Sounds and pictures have to be installed into your system or into the application with ResEdit, so they are not functions you'll use very often.)

BiPlane's Chart function is nearly identical to DeskCalc's. Figure 3 shows the Chart dialog boxes of both programs. In BiPlane, font, size, and style can be applied to any cell, and you can adjust the row height. In addition to the usual cell borders, you can use the Borders function, which lets you create border styles, which you can apply to any part of the spreadsheet. Surprisingly, there's no way to create headers, footers, or page numbers for a printout.

Priced at less than \$60, BiPlane is an exceptional value. Its large number of functions and DA option make BiPlane a good choice for anyone who needs to munch figures occasionally.

DeskCalc

DeskCalc is one of seven DAs/applications in the Zedcor Desk collection (the others are a word processor, a database program, a painting program, a drawing program, a communications package, and an appointment calendar). If you want a spreadsheet program for many little tasks, the DA approach is great, but DeskCalc doesn't limit you to small projects — it's a fully functional spreadsheet program that also has charting capabilities.

DeskCalc supplies a menu bar inside its spreadsheet window so you don't have to use the single hierarchical DA menu to access its commands. Icons at the bottom of the window let you page up and down through a spreadsheet and access the charting and help features instantly. DeskCalc lets you protect cells from inadvertent changes and hide their contents too.

The program doesn't let you split the window (although there's a Freeze Titles command to keep the first row and column from scrolling away), and it has no special pasting options. The formula bar doesn't expand downward as you type — input simply disappears at the right side of the window, but it does appear in the cell when you press Return. If you type something in the formula bar and enlarge the window to give yourself more typing room before you enter the data into a cell, all the input disappears, defeating your purpose in enlarging the window.

DeskCalc's spreadsheet dimensions are 1,000 rows by 2,048 columns, and you can open only one sheet at a time. There are 46 functions, but only 2 in the financial category: PMT (payment, which is probably the most useful financial function) and Net Present Value. Without a function such as Future Value, however, you can't check the results of any investments. DeskCalc can handle strings of text in formulas, but it lacks a lookup function and it can't sort any of its data.

DeskCalc provides eight types of charts, which are easy

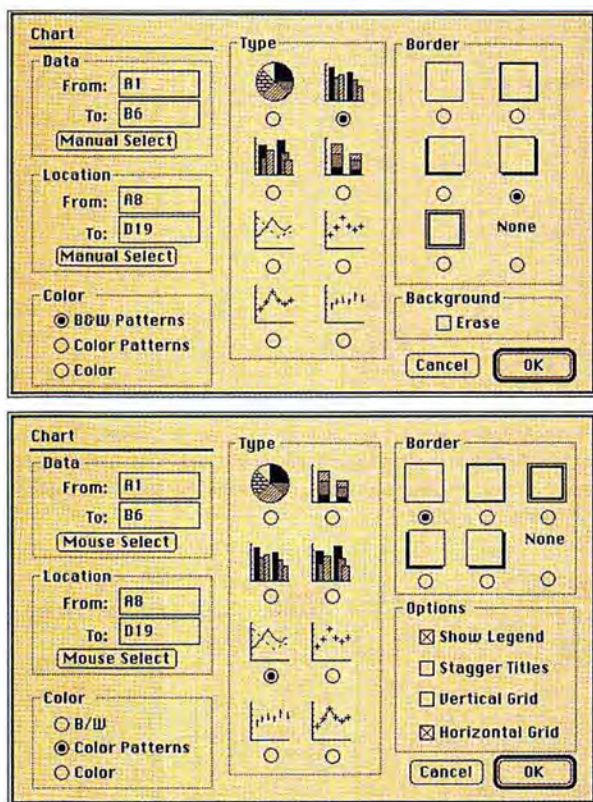


Figure 3: DeskCalc (top) and BiPlane (bottom) have nearly identical Chart dialog boxes.

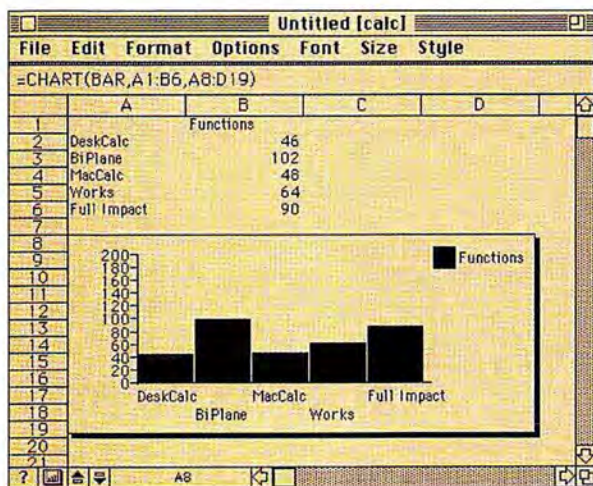


Figure 4: DeskCalc, a spreadsheet DA, provides in-window menus so you don't have to use its single hierarchical menu. The icons in the lower left of the window let you access the help and charting features as well as page up and page down.

Budget Spreadsheets

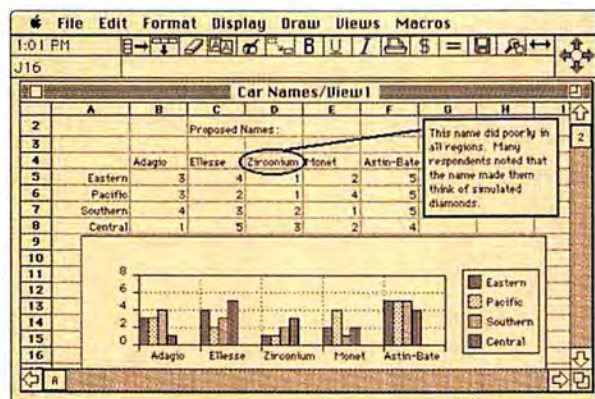


Figure 5: Full Impact 1.1 is included in T/Maker's SmartBundle. Although it's one version behind the current release (2.0), it's more powerful than anything else in its price range. However, it's overkill for most simple tasks.



Figure 6: MacCalc's menu problems exemplify some of its limitations. Note the lack of keyboard command equivalents (left) and its nonstandard rolling menus (right).

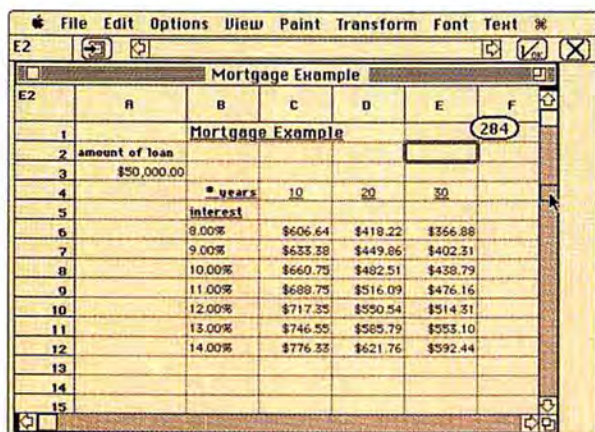


Figure 7: MacCalc gives a readout (the 284 in the oval) of the position of the scroll box as you drag it. In this case, releasing the box would take you to row 284. The nonstandard scrolling entry bar is at the top.

to construct (simply drag the cursor across the data you want to chart, and then drag across the area you want the chart to fill). There's a selection of five bordered backgrounds for charts. Although the program is supposed to let you hide any part of the spreadsheet behind a chart (in case you want to place the chart right on top of its data), this feature didn't always work, so the numbers always showed through.

Charts are defined by the Chart function, which is automatically entered in the top left cell of the chart area (see Figure 4). You can work directly with the Chart function to define a chart or to edit one created with the drag method.

You can format any cell individually for font, size, and style and adjust the row height at any time. Standard borders are available for cells or groups of cells; there's also the Shaded Cell option for color systems, but the shading contains annoying bit-mapped dots. Printing options are limited: You can define a frame for a page, but the program can't create headers, footers, or page numbers.

Zedcor's DA approach makes DeskCalc readily accessible, and it's adequate for most spreadsheet tasks. Its limit of having only one open spreadsheet at a time, however, makes transferring data cumbersome.

Full Impact

The 1.1 version of Full Impact is included in T/Maker's SmartBundle, which also includes WriteNow, a word processor; Record Holder Plus, a flat-file database manager; and SuperPaint, a painting/drawing program. It gets fewer words than any of the other spreadsheets in this article, because it's really on a par with Excel and WingZ rather than with the other spreadsheet programs reviewed here (it's part of this roundup because of its reasonable price).

Although Full Impact (see Figure 5) is now in version 2.0, the bundled version (1.1) is good enough to be tops in all three spreadsheet-program-criteria categories. In comparison with the other products discussed here, it's off the scale. Its interface has all the goodies you could want, including row/column readouts in scroll boxes, an icon bar for quick commands, and a macro language that's better than Excel's. Its 256-x-2,048-cell spreadsheets can be linked to each other, and it features 90 functions, including database operators. For presentations it has charts and graphics galore.

The usual disadvantages of a powerful program — power comes at a price — aren't really true in this case, because the package price is for the bundle and it's a bargain. One problem pertaining to power programs persists: It takes time to learn how to harness power, and if you don't need the power, you've wasted the time. And you should decide if you really want a version of a spreadsheet program that's one revision behind the current edition, which is itself moribund. Also, users considering upgrading to System 7 should know that Full Impact isn't System 7-compatible, and Ashton-Tate hasn't announced a time schedule as to when it might be.

MacCalc

MacCalc won a *MacUser* Eddy Award several years ago, but in today's market, calling it a disappointment is an understatement.

It's the only spreadsheet program whose editing area scrolls instead of expanding downward when your formulas get longer than the allotted space. This approach is different from that of other spreadsheet programs but isn't necessarily better. It also has "rolling menus," nonstandard scrolling menus with half-x's at the ends of the menu to indicate that more commands are available (see Figure 6). The menus don't extend the full length of the screen, so you must use the rolling-menu feature even if you have a large-screen display.

MacCalc complicates a simple operation such as Fill Down or Fill Right (which copies a cell's contents into adjacent selected cells) by making you copy a cell to the Clipboard, select the other cells, and use the Paste Multiple command. It also lacks keyboard command equivalents for basic functions such as New, Open, Close, and Print. In addition, it has no pasting options.

The program does, however, have cell notes, a good help feature, great searching capabilities, and the ability to move cell contents without use of the Clipboard. You can split a window, password-protect a spreadsheet, and protect any cells within a spreadsheet. One nifty feature gives you a readout of what row or column you're moving to when you drag the scroll box to a new position (see Figure 7).

MacCalc's maximum spreadsheet size is 125 columns by 999 rows, but all the cells might not always be available. We found it necessary to double the recommended memory allotment to 750K so that we could put numbers into the first and last cells. Even on an 8-megabyte IIcx with a memory allotment of 750K, we couldn't select all the cells and clear them without running out of memory. Although that's not a large memory partition, this seems to indicate a memory-management problem.

The program has 48 functions, some of which are overly limited. Date functions, for example, can't register a date prior to 1940. The Future Value function accepts only three arguments and assumes that you're putting in a certain amount of money every year. So you can compute an IRA investment of \$2,000 per year, for example, but you can't figure out what the return on a lump-sum investment will be. MacCalc offers a Lookup function, and it can sort selected cells.

MacCalc's presentation and printing options are limited but adequate. You can set the font, size, and style for an entire spreadsheet as well as for individual cells. You can use standard cell borders for cells or groups, and row height is adjustable. When you print, you can frame an entire page and define a header and footer in a barely adequate dialog box.

MacCalc has no charting capabilities, which puts it far behind its competition.

Works

Whereas MacCalc is a disappointment, the spreadsheet module in Microsoft Works is a pleasant surprise.

The module offers many convenient features. You can split the window, paste with special options, move items without using the Clipboard, view cells as formulas or values, protect selected cells from being edited, and use cell notes.

A Works spreadsheet can be as large as 16,382 rows by 256 columns, and you can have as many sheets open as memory allows. Its 64 functions are comprehensive, but it can't handle text formulas. It lacks string functions (which is forgivable), and if you check a cell with the Isblank function, it will tell you that the cell is blank even if it contains text. The Works spreadsheet module meets all the other basic functionality requirements, however, including having a lookup function and sorting capabilities.

The flaws in Works' rudimentary presentation capabilities are compensated for by its drawing layer (see Figure 8).

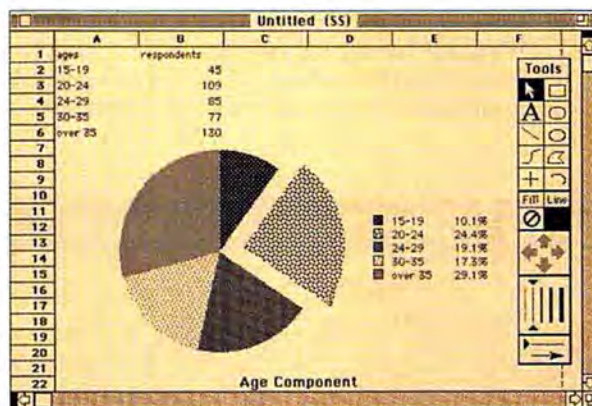


Figure 8: Despite its text limitations, Works has the most useful spreadsheet module. By pasting a chart into Works' drawing layer, you can disassemble the chart and alter its components. This figure shows the original data in the upper left of the spreadsheet.

Figure 9: Except for bold and underline, text formatting in a Works spreadsheet is global, so you can't do much to make it look unique.

Budget Spreadsheets

It offers five types of charts, and Works is the only spreadsheet program in this roundup besides Full Impact that allows a logarithmic x-axis so you can chart very disparate values on the same chart. With logarithmic scaling, you can chart things such as five workers' turning out 300,000 widgets while seven workers make 600,000. Although charts are in a separate window and can't be directly incorporated into a spreadsheet for printing, you can copy a chart and paste it into the floating drawing layer (charts in the drawing layer are no longer linked to the data that generated them). You can manipulate the chart in the drawing layer, changing fill patterns, moving elements around, and even exploding it if it's a pie chart.

Works' other presentation limitation is that you can't format the text of individual cells except by using boldface and underlines — font and size choices affect the entire spreadsheet (see Figure 9). This problem is mitigated to a great extent by the drawing feature, whose text tool lets you type in any font, style, or size anywhere in the spreadsheet.


Works lets you define headers and footers for a printout in an archaic dialog box. Although this dialog box is non-WYSIWYG, it's better than nothing.

In spite of its text limitations, Works' spreadsheet module packs enough power to handle most general spreadsheet tasks.

The Bottom Line

If you're looking for a small but useful spreadsheet program and you already have word-processing, database, and graphics programs, BiPlane is the best deal. It easily beats MacCalc, which costs more than twice as much, and BiPlane's DA version is an extra convenience.

Recommending a spreadsheet module that's part of a bundled package is much more difficult: The worth of the package depends on how good the other components are and how much you need them. Full Impact is undoubtedly the best spreadsheet program in this roundup, but it's frustrating to use a hammer to kill a fly when flyswatters are available. Zedcor's Desk package is a great approach if you need a little bit of everything, but keep in mind that you're only getting a little bit — DeskCalc's overall rating is fourth. (For more on the total Desk package, see review, January '91, page 74.)

That leaves Microsoft Works, a tired- (that's not a typo) but-true package that includes an adequate word processor, a limited database manager, a crippled communications program, and the most sensible spreadsheet program available. 

Sharon Zardetto Aker is the primary author of the third edition of *The Macintosh Companion* and *The Macintosh Bible*, recently published by Addison-Wesley.

Table 1: Budget Spreadsheet Programs

	BiPlane 2.03 ★★★★	DeskCalc 3.03 ★★★★½	Full Impact 1.1 ★★★★	MacCalc 1.2 ★★★	Works 2.0 ★★★★½
List price	\$59	\$399.95*	\$349*	\$139	\$295*
Pros	Incredible array of features, including charts. Great price. DA version included.	Part of Desk, a set of seven DAs. Many functions and formatting capabilities. Menu bar in window.	Part of T/Maker's SmartBundle. Rivals Excel and WingZ in power. Powerful macro language. Excellent presentation features.	Good help and search functions. Split windows. Cell protection.	Best overall capabilities. Powerful drawing function.
Cons	Slow at some tasks such as filling selected cells and cutting and clearing cell contents.	Weak financial functions. No sorting. Only one sheet open at a time. No headers or footers.	Version 1.1 is one version behind current version (2.0). Product's future is uncertain.	Nonstandard, rolling menus. Few keyboard command equivalents. Limited number of functions. No charting. Poor memory management.	Can't handle text formulas. Limited text formatting.
Company	Night Diamonds Software P.O. Box 1608 Huntington Beach, CA 92647 (714) 842-2492	Zedcor 4500 E. Speedway Ste. 22 Tucson, AZ 85712 (602) 881-8101	T/Maker Co. 1390 Villa St. Mountain View, CA 94041 (415) 962-0195	Bravo Technologies, Inc. P.O. Box 10078 Berkeley, CA 94709 (415) 841-8552	Microsoft One Microsoft Way Redmond, WA 98052 (206) 882-8080

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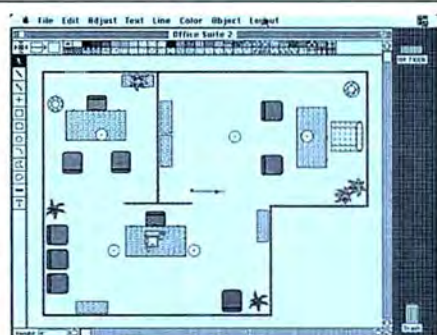
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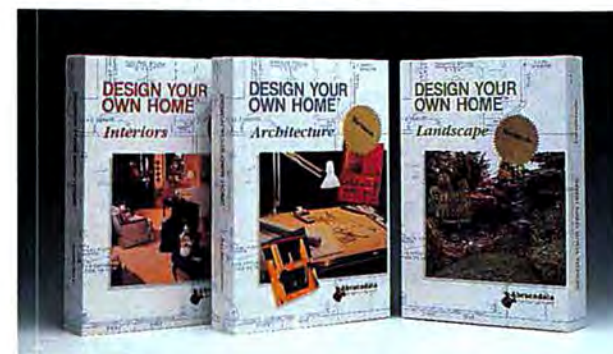
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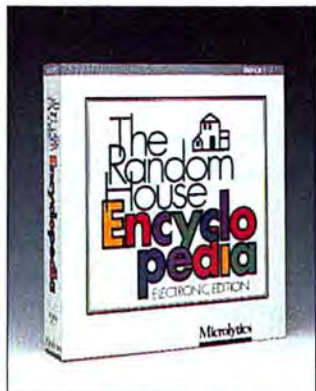
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BY

**STEPHEN SATCHELL,
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digital-audiotape — DAT — cartridge is less than half an inch thick and smaller than a business card. But don't let its petite dimensions fool you: One standard DAT cartridge can hold 1.3 gigabytes of data.

That's room for a double-spaced report stacked taller than the Washington Monument.

Even more surprising is how quickly this gargantuan capacity can be filled with 24-bit scanned images, color page layouts, sound files, and digital video. Ask anyone who works with monster-file makers such as Adobe Photoshop,

Digidesign's Deck, or QuarkXPress—a gigabyte of backup space just ain't what it used to be.

The technology that crams such an enormous amount of data onto a tiny, inexpensive cartridge is the same that brings high-fidelity, concert-hall-quality sound into the living rooms of the most-advanced audiophiles—hence the name digital audiotape. Add error-correcting circuitry, a SCSI port, and software, and you have the most cost-efficient backup technology available today. What's more, heated competition among several manufacturers is making DAT drives more affordable daily. For this month's report,



PHOTOGRAPHY: WALT DENSON



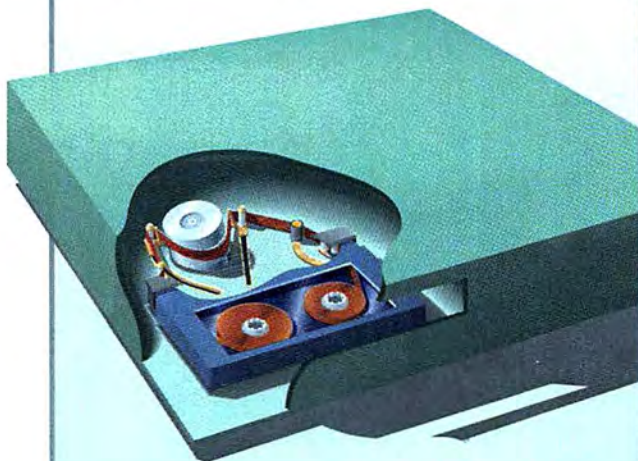
we tested 19 that start at a little less than \$1,500, compared with \$3,000 last year.

Two key advantages of DAT are its high capacity and low cost (see Figure 1). An 88-megabyte removable SyQuest cartridge costs about \$175 and a 600-megabyte magneto-optical disc about \$200, whereas a 60-meter DAT cartridge holds a minimum of 1.3 gigabytes and costs less than \$20. Convenient transport is another factor: The low weight — less than 2 ounces — and sturdy construction of a DAT cartridge let you ship data across the country for pennies per megabyte.

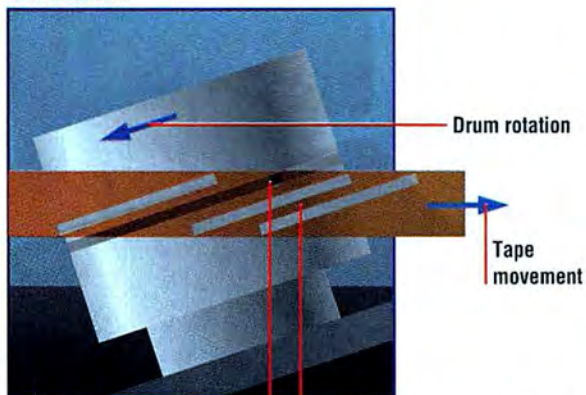
DAT is not the first tape format available for the Mac — just the best. Earlier generations of backup tape may require a lower initial investment, but they don't approach DAT's storage capacity. For example, a data cartridge such as the Teac 60, which is similar to the popular Philips-type audiocassette, holds only 60 megabytes; the 20-year-old quarter-inch 3M data cartridge can hold up to 250 megabytes; and its downsized brother the DC2080 holds 80 megabytes. DAT's *helical-scan* technology — a technique that was originally designed for videotape recording that creates diagonal rather than

How It Works: Helical-Scan Recording

In helical-scan recording, the read and write heads are mounted on a spinning drum that is mounted at a slight angle to the tape. The drum spins as the tape moves past it, and the heads track at a slight angle to the tape. This places the tracks of information in tightly packed narrow rows, saving space and allowing much information to be stored.



Detail of drum



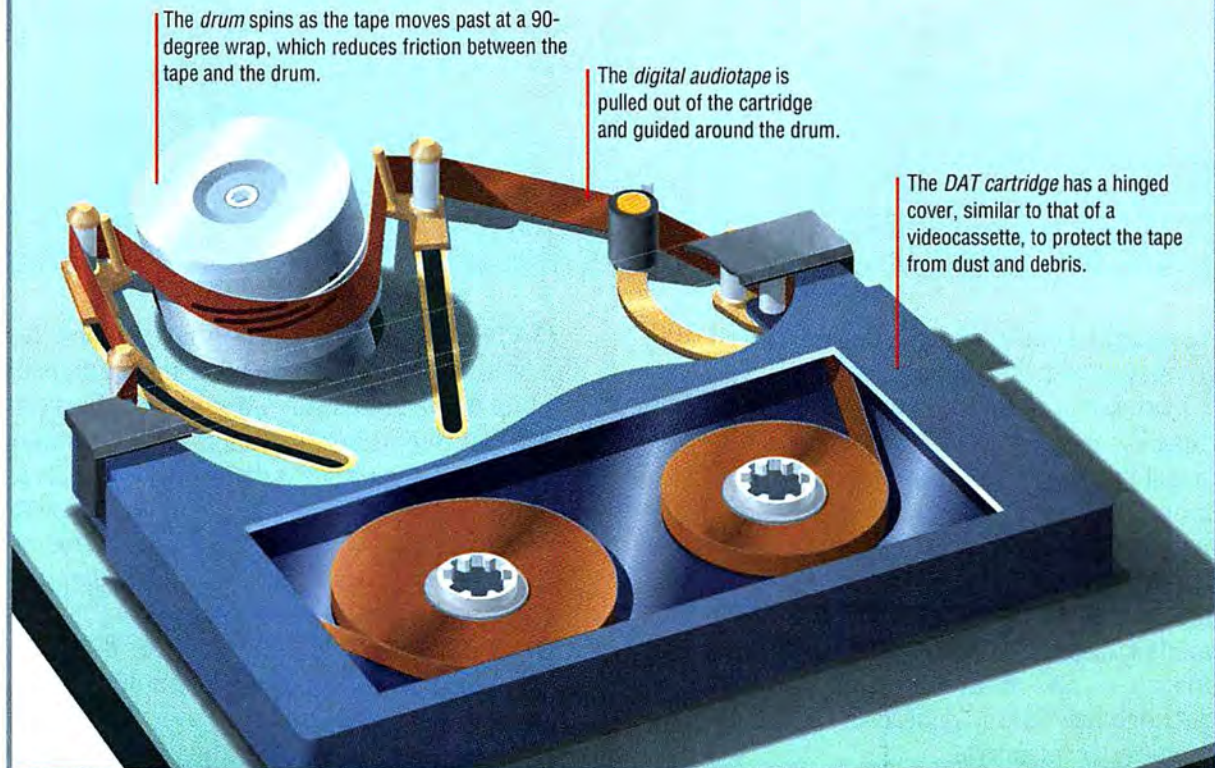
Four heads are equally spaced around the drum. One pair of heads is for writing, and the other pair is for reading after writing — part of the error-checking process.

Helical-scan technology writes data in stripes at a shallow angle to maximize the use of the tape's surface area. The relationship between the spinning head and the stripes of data forms a *helix*, or corkscrew pattern.

The drum spins as the tape moves past at a 90-degree wrap, which reduces friction between the tape and the drum.

The digital audiotape is pulled out of the cartridge and guided around the drum.

The DAT cartridge has a hinged cover, similar to that of a videocassette, to protect the tape from dust and debris.



longitudinal tracks on the tape — has the older technologies beat by a mile (see the “How It Works: Helical-Scan Recording” sidebar).

DAT's only real competitor is another helical-scan technology: 8-millimeter videotape. Commonly known by the mechanism vendor's name — Exabyte — 8-millimeter drives store 2.2 gigabytes on a standard cartridge, and some advanced drives use hardware compression to cram up to 25 gigabytes onto a single cartridge — that's nearly 10,000,000 pages of text. However, DAT drives take up less desktop real estate, and their 4-millimeter cartridges are smaller and therefore easier to store and mail. Also, the cartridges are self-sealing, offering an extra margin of protection against environmental hazards such as dust and eraser crumbs. In addition, the cost of DAT equipment is dropping faster than that of 8-millimeter-tape storage systems and should continue to do so as mechanism manufacturers jockey for market share.

The 19 drives we tested for this month's report each use a mechanism from one of four manufacturers — Archive, Hewlett-Packard/Sony, WangDAT, and WangTek — and all use the DDS (Digital Data Standard)

format for storing data on tape. DDS is the de facto standard for backup storage recently endorsed by the DDS Manufacturers' Group, a coalition of more than 20 drive vendors. DATA/DAT, an alternative DAT storage format that lets you mount your DAT cartridge on the desktop, is being adapted for use in multimedia environments, because its file-finding strengths make it ideal for file-by-file image retrieval. DDS, on the other hand, is strictly a streaming-tape technology and as such has faster throughput than DATA/DAT. If the data is compressed as it's being written onto the tape — an increasingly popular tactic — throughput can also be increased (see the “Compression Drives” sidebar).

Reliability, however, is more important than mere speed: When you need to restore a file from a DAT cartridge, it had better be intact. We conducted our tests accordingly. In addition to timing a series of backup and restore operations, we checked the integrity of the data at each step, using CompareFolders, a MacUser Labs custom application. We also assessed ease of use, evaluated distinguishing features, and examined the manufacturing quality of each drive's internals.

Plug-n'-Play Installation

When we looked under the hood of each drive, we found a few surprises — all pleasant. Although all the drives are well designed and built, some deserve special mention. The APS Archive Python, Irwin 9131Se, and PCPCDATStream each use a compact 3.5-inch Archive mechanism with plenty of high-grade metal to shield the drive's electronics from the power supply and the tape-transport mechanism. Such high-quality protection also shields the heads from radio-frequency interference. The hefty Tecmar DATaVault also has a lot of shielding.

The ADIC MacBack DAT has a large cabinet that holds a 105-watt power supply, even though the DAT drive requires no more than 20 watts. Fortunately, the MacBack's fan keeps the air moving, so the drive runs cool.

All the units we tested are shipped as complete packages: drive, SCSI cable, and software. Installing a DAT drive is as simple as finding a free spot on your desk and cabling the drive to your Mac. If the DAT drive is the only external SCSI component of your system, just use the Mac-to-drive cable — with a 25-pin connector on one end and a 50-pin connector on the other — supplied by the manufacturer. If you

Compression Drives

Data compression typically almost doubles or triples the amount of data a DAT drive can squeeze onto a given length of tape. A compression *algorithm*, stored in the DAT drive's hardware, replaces multiple patterned bytes — in text, spreadsheet, or graphics files, for example — with shorter code, thus saving space. Different algorithms achieve varying levels of compression, but capacity is usually doubled or tripled. The composition of the file also plays a part in how much it will actually be compressed: If there's a lot of redundant data — such as a large area of the same color in a graphics file — compression will be greater. If the data has already been compressed — by Stuffit or another such program, for example — the algorithm might not be able to shrink it further.

Two compression standards have emerged in the data-DAT world. The DDS-DC (Digital Data Standard-Data Compression) format is endorsed by the DDS Manufacturers' Group. The alternative is Group Compression, as implemented in the Stac compression chip used in the Archive, WangDAT, and WangTek compression mechanisms. The WangDAT 2600 uses a Stac compression chip that can double the amount of data that fits on a DAT cartridge. The newer Mystic chip,

used in HP/Sony mechanisms, can squeeze data into as little as a third of the space it would normally occupy.

The two algorithms are not compatible — if you compress files on an HP/Sony mechanism, you won't be able to restore the tape on a WangDAT 2600 mechanism. But backups made with compression turned off can be restored by either mechanism. The next generation of DAT drives is expected to enable all mechanisms to read and decompress tapes, using either algorithm, although non-native-format reading and decompression will occur more slowly.

In addition to increasing capacity, compression increases throughput. MacUser Labs ran the same suite of backup and restore benchmark tests on the MicroNet MD-5000 and the TTI CTS-4M Plus, which use the WangDAT 2600 mechanism with on-board compression. We averaged the results and compared them with the average of all the WangDAT 1300-based drives. Overall throughput for our tests was about 15 percent faster with compression. This increase is not a hard-and-fast number, though — depending on the files being compressed, more data or less can get squeezed onto the tape.

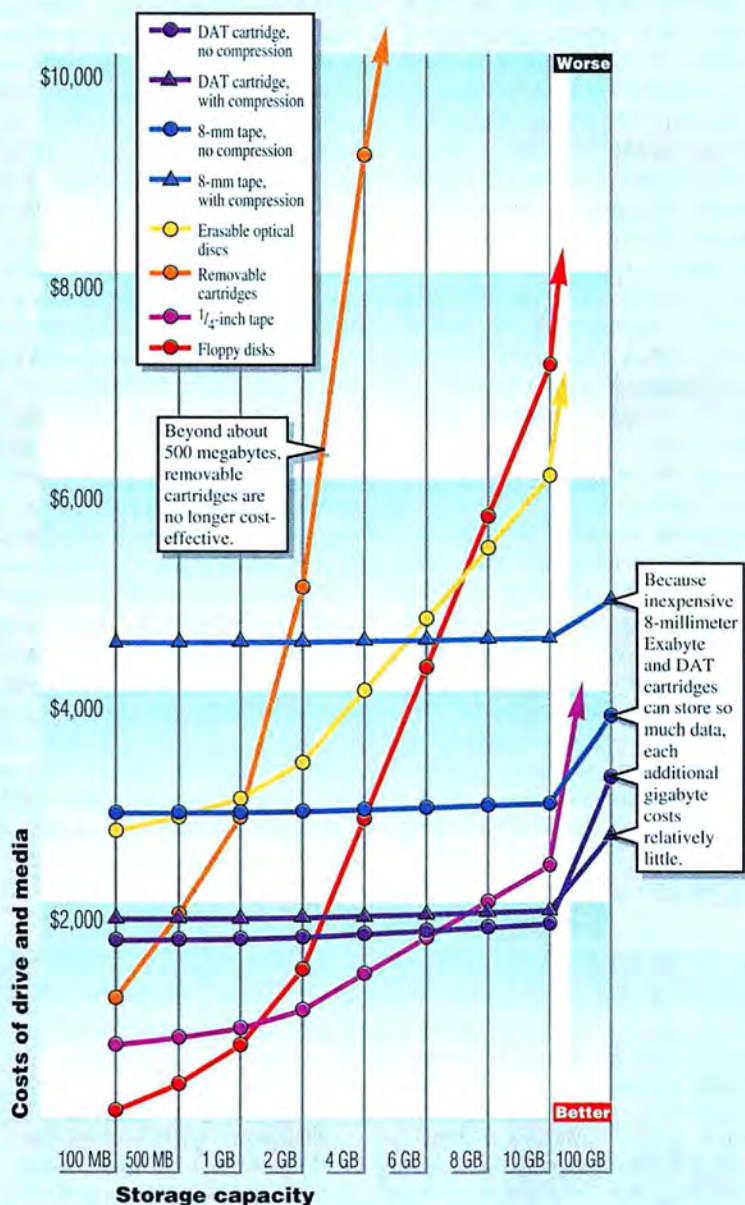
Figure 1: Costs of Backup Systems


Figure 1: The more files you need to store, the more you should consider DAT. We compared the costs of various backup systems — the cost of a single drive plus media — and found that DAT drives are the most cost-effective backup devices if you need to store more than 8 gigabytes.

already have an external hard-disk drive, scanner, or other SCSI device, you'll need to get a drive-to-drive cable with 50-pin connectors on each end — unless you buy a DynaTek DAT 1300

or an EMAC Metro DAT, which also include a drive-to-drive cable.

All the drives have an external switch for setting the appropriate SCSI-ID number. Most use external SCSI-bus

terminators, except for the HDI POWERDrive 1.3 Gig DAT, MacTel INDEX 2.0GB DAT, and Third Wave DATadrive 2.0 GB — these must be the last device in your SCSI chain. (Third Wave offers external termination for an additional \$19.) The MacProducts MagicTape 1.3GB drive housing includes a convenient feature — switched outlets for connecting your Mac and other peripherals.

After you've connected the cables and set the SCSI ID, you can turn on your Mac and the DAT drive — the DAT drive first, as with any SCSI peripheral. No icon appears on your desktop, because the DATDDS format is not desktop-mountable. You need backup software to use the drive: Simply drag the software from the installation floppy disk to your Mac's hard disk, or run the installation program.

Solid Software

Although you might think 1,331 megabytes is impossible to fill, it isn't if you back up all your files (do a *complete backup*) or a complete network every time. Fortunately, all the backup software bundled with the DAT drives lets you save media — and time — by making *incremental backups* of your files — backing up only new or changed files, once you have a complete backup on tape.

None of the software is difficult to use, but HammerBackup 1.1E, bundled with the FWB HammerDAT 1.3G, and Nightshift 1.5, bundled with the TTI CTS-4M, although limited in features, get extra credit for ease of use. Nightshift is designed for backing up many Macs over an AppleTalk network (see "Overnight Success: Network Backup," August '91, page 112), but it can also back up a single Mac connected to any TTI tape drive.

AD-Mac Backup 1.1, bundled with the CMS Platinum DAT, has a few shortcomings. It has no activity log, nor does it have a dialog box to notify you of the success or failure of a backup — basic features that should be part of every backup application. Fortunately, a new release of AD-Mac Backup that

addresses these problems should be available by the time you read this.

Of the 19 drives we tested, 13 are bundled with a version of Retrospect 1.2, from Dantz Development. Retrospect's sophisticated feature set makes it hard to beat. As you select the files you want to back up, Retrospect saves your commands in a default script so that the next time you back up, your settings are waiting for you. It also lets you create and name other scripts, so you can build a library of backup procedures. You can also use Retrospect's Calendar and Auto Launch features to automate backups completely.

The EMAC Metro DAT, FWB HammerDAT 1.3G, MicroNet CPKD-2000, and Peripheral Vision PV-DAT are bundled with a four-user version of Retrospect Remote 1.2, enabling backup over a network. ADIC's

MacBack 2.02, bundled with the ADIC MacBack DAT, and PCPC's NetStream 2.0.4, with the PCPC DATStream, also let you back up several Macs over a network. Tecmar's QTBackup 2.04 is nearly as powerful as Retrospect, having extensive file-selection and scripting capabilities. With the addition of the QTShare utility, QTBackup can also back up over a network. For a limited time, Tecmar is bundling QTShare with QTBackup at no extra charge.

Some Twists on Tape

To perform a backup, insert a fresh DAT cartridge into the drive, label side up and with the write-protect switch in the correct orientation — moved to the right. Each drive vendor recommends certain types of cartridges for use with its drive, and to be safe —

and also to avoid warranty hassles — you should follow the recommendation of the vendor.

Two grades of DAT cartridges are available: Audio-grade-DAT cartridges are designed for sound recording, and data-grade cartridges are specially made for DAT drives that will be used for data storage. Many vendors ship audio-grade-DAT cartridges with their drives, and if you follow their recommendations for using these tapes, you'll save money in the long run (see the "Audio-Grade Versus Data-Grade DAT" sidebar).

The tape inside data-grade-DAT cartridges is available in two lengths — 60 meters and 90 meters. Until recently, all digital audiotape was .5-millimeter thick, and 60 meters was the maximum length of tape that would fit in a cartridge. A 60-meter tape can

Audio-Grade Versus Data-Grade DAT

Audio-DAT drives record sound, and data-DAT drives record data — but in both cases the recording is made the same way: digitally. And both types of DAT drives use the same electronic components to lay the digital information onto the tape. So why are some cartridges labeled "computer," or "data-grade," and what are the differences between audio- and data-grade-DAT cartridges?

For starters, a data-grade-cartridge *shell* — the case — is specially engineered to minimize jams caused by high-speed tape activity. An audio drive is usually used to record or listen to a tape straight through, whereas a data-DAT drive is used for backing up and restoring data — the drive shuttles the tape back and forth, building a catalog, finding a file to restore, and so on. A data-grade-DAT-cartridge shell can hold up better under such stress.

High-speed motion also stresses the coating on the tape, so data-grade-tape vendors use a special *binder* that prevents the coating from flaking or wearing off the tape. Also, quality control for data-grade tape is more stringent than for audio-grade tape: Bulk data-grade tape is 100-percent scanned and certified free of defects *before* being loaded into DAT cartridges. Only a small percentage of completed audio-grade cartridges are spot-checked — a defect in an untested tape won't be caught until after purchase.

Given such rigorous quality controls, it's not surprising that data-grade DAT is more expensive than audio-grade. At about \$20 each, data-grade cartridges are roughly twice the price of audio-grade ones. And although many of the DAT drives ship with audio-grade tape and mechanism vendors have tested their products with audio-grade tape, tape vendors don't warrant audio-grade DAT for use with data. But if you get stuck without data-grade-DAT cartridges, you can go ahead and use a high-quality, name-brand audio-grade-DAT cartridge with the assurance that it will probably work well enough — just keep in mind that you do so at your own risk.



Data-grade cartridges are rated by length, in meters, whereas audio-grade cartridges are rated by playing time, in minutes.

Audio-grade cartridges are rated by playing time — 120 minutes, for example. Two minutes of sound can be recorded on one meter of tape, so a 120-minute cartridge contains 60 meters. Such tapes are often labeled "digital audiotape," "RDAT" (rotating-head digital audiotape), or simply "DAT." A typical data-grade-DAT cartridge also contains 60 meters of 4-millimeter-wide tape. Data-grade cartridges are typically labeled "DDS," "data cartridge," or "certified," and the tape length is marked in meters. Some tape vendors offer 30-meter-tape cartridges as well, although at press time, the prices of the shorter-length-tape cartridges were almost as high as those for 60-meter-tape cartridges.



Figure 2a: Of the 19 drives we tested, 13 come bundled with Retrospect, which features scripting, a calendar, and automatic launching.

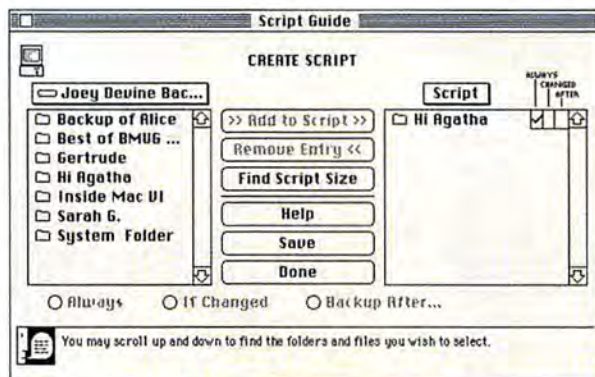


Figure 2b: The Relax Tape Vista DAT is bundled with Diversified I/O's SoftBackup•II backup software. As with Retrospect, you can create scripts that run when scheduled.

hold a maximum of 1.3 gigabytes without compression and 2.5 gigabytes with compression. So that 90 meters of tape would fit into the cartridge, the tape was made thinner — .4 millimeters thick. With a 90-meter cartridge, you can store 2.0 gigabytes without compression, 3.7 gigabytes with standard compression, and — theoretically — more than 5 gigabytes with advanced hardware compression techniques.

Because the thickness of the tape is different and the delicate DAT mechanisms must be able to adapt, not all drives can accommodate both 60- and 90-meter tape. But if a drive accepts 90-meter tape, it will also accept 60-meter tape. Just about all vendors are modifying their mechanisms to support both lengths.

As you slide the cartridge into the drive, the mechanism grabs the cartridge and pulls it into the slot, much as a VCR pulls in a videocassette. When you insert a blank cartridge, the DAT drive typically locates the beginning of the tape and places header information there. Some of the backup software refer to this process as *initialization*; some call it *formatting*. Regardless of what the process is called, it shouldn't take very long — say about 30 seconds — to prepare a new blank tape. The TTI CTS-4M, however, takes about 3 minutes, because it also checks the tape's quality.

You use the backup software to select the files you want backed up and to specify when you want the backup to occur. All the software lets you schedule backups, so you don't have to babysit the drive (see Figures 2a and 2b). But don't leave the cartridge in the drive for too long — leaving the tape pressed against the heads of the mechanism can result in deposits building up on the heads.

DAT-Drive Maintenance

Just as with your VCR, the heads of your DAT drive require occasional cleaning to keep them working properly. Be sure to find out early on how to clean your drive's heads: Some are self-cleaning, and others require cleaning after a given number of hours of operation. The FWB HammerDAT 1.3G, PLI PLI DAT Drive, Tecmar DATaVault, and Third Wave DATa-drive 2.0 GB are self-cleaning, but instructions on the others vary as to occasional cleaning. Be sure to check the manual for particular cleaning requirements.

If you do have to clean a drive, use only a DDS cleaning cartridge such as the Sony DG-5CL; audio-grade cleaning cartridges are not the same and can cause excessive wear of the DAT drive's read and write heads. Label your cleaning cartridge, keep track of the number of cleanings, and discard the cartridge when you reach its limit

— usually about 25 cleanings, but check the cartridge manufacturer's specifications.

Speedy Backup

We connected each DAT drive to a Mac IIci with 30 megabytes of files tucked into folders on its hard disk. We then ran each drive through a battery of backup-and-restore benchmark tests: We timed a complete backup and a complete restore and then modified a file three times in succession, each time performing an incremental backup. We also timed how long it took each DAT drive to restore a single file and to restore the last file in the backup set. After each restore, we used our CompareFolders utility to confirm that the data was intact. We repeated these tests with at least three cartridges provided by the drive vendors.

All DAT drives have a fixed data-transfer rate of 183K per second, but actual performance is affected by how well the software manages the *catalog*, or directory of files, and by the tape-positioning technology within each of the drive mechanisms. The nine fastest performers each use an Archive mechanism, and seven of these use Retrospect software (see Figure 3). Next in line come the FWB HammerDAT, Tecmar DATaVault, Procom MDAT1300/M, EMAC Metro DAT, and CMS Platinum DAT; all but the Tecmar DATaVault use a WangDAT

mechanism. WangTek mechanisms are used in the three slowest performers — the PLI DAT Drive, Third Wave DATdrive 2.0 GB, and MacProducts MagicTape 1.3GB.

In the test that consisted of a complete backup of a 30-megabyte folder, the Peripheral Vision PV-DAT ranked first, at a bit over 3 minutes — impressive speed, given that copying the same files from one hard disk to another in the Finder took about 15 seconds more. The Third Wave DATdrive 2.0 GB came in last, at 5.5 minutes.

Retrospect is optimized to work with MultiFinder. By and large, most of the drives fared better under MultiFinder than under the Finder, with the exception of the PCPC DATStream, Relax 1.2 Gig Tape Vista, CMS Platinum DAT, TTICT-4M, and MacProducts MagicTape 1.3GB. The Tecmar DATaVault was equally slow under both the Finder and MultiFinder, turning in times of close to 5 minutes.

Times for restoring the files were not as wide-ranging, because the Mac can accept only so much data at a time.

The ADIC MacBack DAT — the only drive in the group that uses an HP mechanism — stands out as being much slower than the others in the complete-restore test.

In addition to restoring files when disaster strikes, you may also want to selectively restore (*retrieve*) files that have been removed for permanent storage, or *archived*. You may, for example, want to retrieve all the graphics and financial files from last year's annual report for use as a starting point for this year's annual report.

On the Horizon

Even though DAT backup and storage is only now gaining acceptance in the Mac marketplace, vendors are already rushing to upgrade their drives. For example, most mechanisms can now use 60- or 90-meter tape interchangeably and many include compression as a standard feature.

DynaTek recently announced the DAT 2600 (\$3,295), which uses a new 3.5-inch ARDAT 2600 compression mechanism that can handle 60- and 90-meter tapes. With compression and 90-meter tape, the DAT 2600 can hold as much as 8 gigabytes of data; the drive will be bundled with Retrospect 1.3. DynaTek Automation Systems, Inc., 15 Tangiers Road, Toronto, Ontario M3J 2B1, Canada; (416) 636-3000.

Liberty Systems is packaging the compact Archive 3.5-inch mechanism in a sleek black case and calling it the Liberty DAT (\$1,995). The drive weighs just 3 pounds and is bundled with Retrospect 1.3. Liberty Systems, 160 Saratoga Avenue, Suite 38, Santa Clara, CA 95051; (408) 983-1127.

Loviél Computers is now shipping the Maxcess 1300D (\$2,295) and the Maxcess 2600D (\$2,895). The Maxcess 1300D uses the WangDAT 1300 mechanism, and the Maxcess 2600D uses the WangDAT 2600, which has on-board compression. Both are bundled with Retrospect 1.3. Loviél Computers, 250 Park Avenue S., New York, NY 10003; (212) 979-8824, ext. 280.

MacDirect is now bundling a WangDAT 1300 DAT drive (\$1,698) with Diversified I/O's SoftBackup•II. It doesn't offer compression, but the price is certainly right. MacDirect, 5251 W. 73rd Street, Suite I, Edina, MN 55439; (800) 621-8461.

By the time you read this, Microtech's T1200 (\$2,799) DAT drive, based on the WangDAT 1300 mechanism, will have been replaced by the Microtech T2000. No price is known yet, but the T2000 isn't expected to cost much more than the T1200. The T2000 uses the new WangDAT 2000 mechanism, which features support for 60- and 90-meter tapes as well as compression, so its storage capacity will range from 1.3 to 5 gigabytes. The compression scheme is WangDAT's own, but the drive will also be able to decompress and read data that has been compressed with DDS-DC compression. Included in the package is Microtech's new RunningBACK tape-backup software. Microtech is bundling RunningBACK with all its drives, including streaming-tape and optical drives. Microtech International, 158 Commerce Street, East Haven, CT 06512; (203) 468-6223.

Tallgrass Technology, a familiar name to PC users, is moving into the Mac market with its FS1300 DAT drive (\$4,595). It uses a WangTek mechanism and is bundled with Retrospect 1.3. Tallgrass Technology, 11100 W. 82nd Street, Lenexa, KS 66214; (800) 736-6002.

Tecmar will be shipping a new version of the DATaVault, featuring on-board compression, support for 60- and 90-meter tape, and new QTBackup 3.0 software — and at the same price as the earlier DATaVault. For a limited time, Tecmar is bundling QTShare with all of its drives, including the new DATaVault. Tecmar, Inc., 6225 Cochran Road, Solon, OH 44139; (800) 624-8560 or (216) 349-0600.

Backup software is advancing as well. Dantz Development released Retrospect 1.3 (\$449) just as we finished testing. This version is System 7-compatible and expands the maximum amount of data you can back up in a single session from 2 gigabytes to 4,096 gigabytes — 4 *terabytes* — enough room to store 1,500,000,000 pages of single-spaced text. Of course, no drive exists that can take full advantage of this astounding capacity — yet. Vendors bundling Retrospect with their DAT drives should be offering the newer version by the time you read this. Dantz Development Corp., 1400 Shattuck Avenue, Suite 1, Berkeley, CA 94709; (415) 849-0293.

Retrospect's expanded storage capacity is going to come in handy if you manage a large network and plan to use a DAT *stacker*, or *jukebox*, to help snag all your data. In August PLI announced the DAT Stacker, built around a WangTek mechanism and with the ability to hold up to eight 90-meter DAT cartridges. The Stacker is expected to retail for less than \$10,000 and is bundled with Retrospect 1.3. PLI, 47421 Bayside Parkway, Fremont, CA 94538; (800) 288-8754.

Expect to see other vendors packaging Archive's PythonSLE DAT Auto Loader, which has a five-cartridge magazine, uses either 60- or 90-meter DAT cartridges, and features optional magazines that hold as many as 16 cartridges. Archive Technology, 1650 Sunflower Avenue, Costa Mesa, CA 92626; (714) 641-1230.

CMS Enhancements should be shipping AD-Mac Backup 1.2 backup software, a completely revamped version featuring compression as well as System 7 compatibility, by the time you read this. CMS has also announced the CMS Platinum DAT 2600 (\$3,999), which is based on the WangDAT 2600 and features on-board compression. CMS Enhancements, 2722 Michelson Drive, Irvine, CA 92715; (714) 222-6000.

— Darryl Chan

Figure 3: DAT-Drive Speed

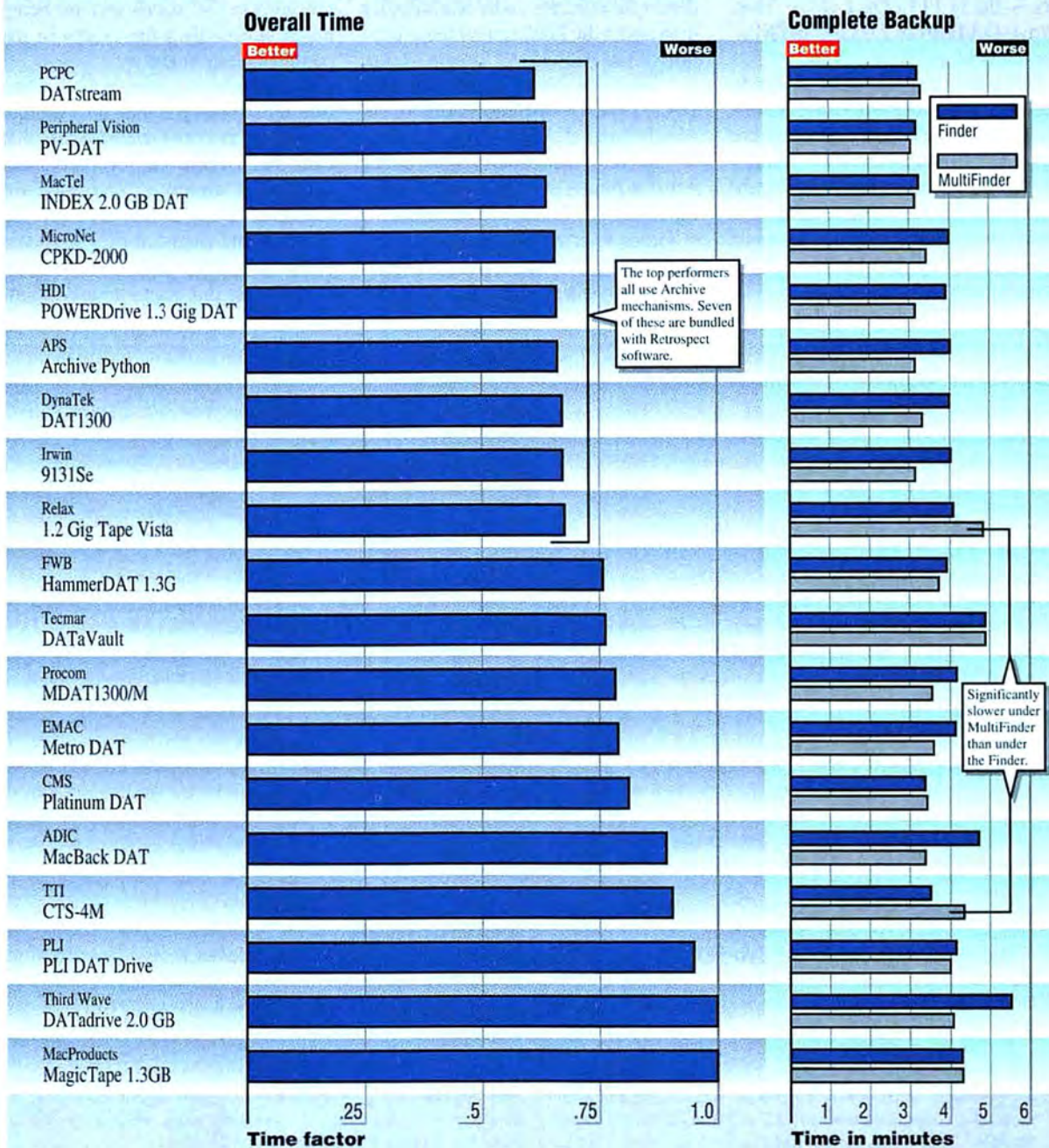


Figure 3: Good DAT-drive performance is a combination of powerful hardware and efficient software.

Overall Time:

We tested each drive with a 4-megabyte Mac IIci and a Quantum 80-megabyte hard drive holding 30 megabytes of files. A drive's performance is linked to its mechanism and the software it uses — the top nine performers use the Archive mechanism, and seven of these use Retrospect software.

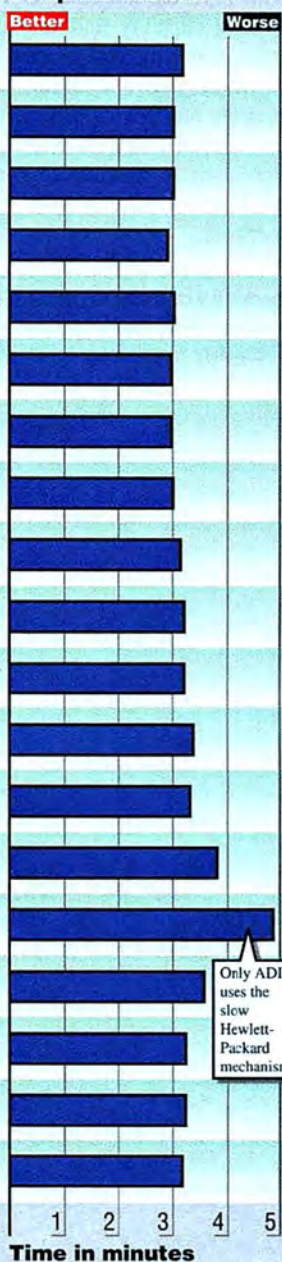
Complete Backup:

We backed up a 30-megabyte folder under the Finder and under MultiFinder and found that most software is optimized for running under MultiFinder. The Peripheral Vision PV-DAT was the fastest drive here, taking only about 3 minutes to back up the 30 megabytes.

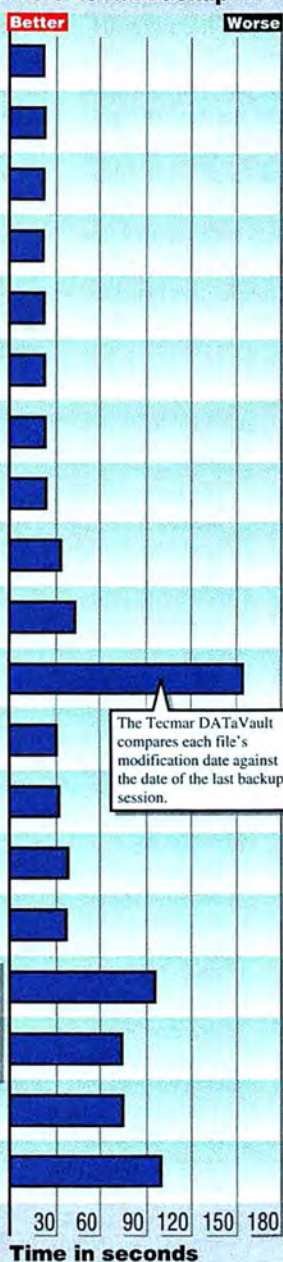
Complete Restore:

The restore speeds don't vary much from drive to drive, showing that the bottleneck is the speed at which the Mac can read the

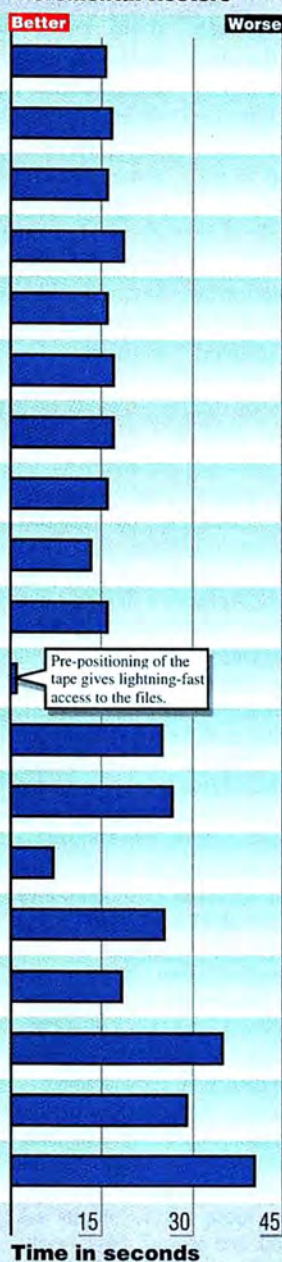
Complete Restore



Incremental Backup



Incremental Restore



The Tecmar DATaVault compares each file's modification date against the date of the last backup session.

Pre-positioning of the tape gives lightning-fast access to the files.

Only ADIC uses the slow Hewlett-Packard mechanism.

incoming data. However, the ADIC MacBack DAT — the only drive that uses an HP mechanism — was noticeably slower than the rest.

Incremental Backup:

An incremental backup saves time — and tape — by backing up only those files that have changed since the complete backup. This test highlights how well the software and hardware work together to keep track of what's on the tape, because the backup software must refer to the catalog of files that make up the complete backup and

figure out which files need to be added. The MicroNet CPKD-2000 was almost 7 times as fast as the Tecmar DATaVault.

Incremental Restore:

The time it took the Tecmar DATaVault to perform an incremental backup was compensated for during incremental restore — the DATaVault's speed on this test was impressive, despite the drive's use of the slower WangTek mechanism. The Tecmar DATaVault was almost 15 times faster than the fastest Archive/Retrospect combo.

Depending on the indexing methods the software uses, selectively retrieving a file can take a lot longer than restoring all the files or restoring an incremental-backup session. Because Retrospect is optimized for the two functions that DAT-drive users perform most frequently — backing up and restoring — it can take much longer to retrieve a single file — up to six times as long in extreme cases.

DAT to the Rescue

The Mac has earned its reputation as a great graphics workstation, but as a result, large 24-bit-color files, scanned

images, and other such megabytes abound — 20-, 30-, and 40-megabyte Photoshop files are not uncommon. With the advent of multimedia, enormous sound and video files are also becoming commonplace. Large files translate into large, jam-packed hard disks. For most users, the days of backing up onto a fistful of floppies are long gone. Quarter-inch tape and other media don't offer the same high capacity and low cost in as small a package as digital audiotape. DAT drives bring fast, reliable, and competitively priced backup to your desktop — or to your network.

All the drives we looked at are complete hardware and software packages that you can begin using today to safely store your hard-earned data. DAT's large storage capacity and tiny cartridges save you time and money, especially when you're working with high-capacity hard disks. Speed differences form clear-cut lines behind the different drive mechanisms, and software plays a role in how easy backup can be.

Stephen Satchell is a consultant and writer. H. B. J. Clifford is a former *InfoWorld* editor and coauthor of *DBXL* and *Quicksilver Programming: Beyond dBASE*.

The Bottom Line

Using digital-audiotape (DAT) cartridges is a fast and economical way to store large amounts of data. Each 60-meter DAT cartridge holds 1.3 gigabytes without compression, making DAT ideal for multimegabyte hard-disk and network backup. You can direct your DAT drive to automatically back up your hard disk completely once a week and to perform incremental backups twice weekly — and keep all the data on the same DAT cartridge.

The 19 DAT-drive packages we tested use mechanisms from four manufacturers — Archive, Hewlett-Packard/Sony, WangDAT, and WangTek — and 13 bundle Retrospect backup software. The top 9 performers use Archive mechanisms, and 3 — the **APS Archive Python** (\$1,499 direct), **Irwin 9131Se** (\$3,696 list, \$3,400 street), and **PCPC DATStream** (\$3,995 list, \$2,195 street) — use Archive's compact brick-sized case. In addition to the APS Archive Python, a few other price-busters are among the top drives: the **DynaTek DAT 1300** (\$1,795 list, \$1,495 street), **HDI POWERDrive 1.3 Gig DAT** (\$1,495 direct), **MacTel INDEX 2.0 GB DAT** (\$1,799 direct), and **Relax 1.2 Gig Tape Vista** (\$1,448 direct).

Seven of the top nine performers are bundled with a version of Dantz Development's Retrospect software; the **MicroNet CPKD-2000** (\$2,995 list, \$2,000 street) and the **Peripheral Vision PV-DAT** (\$2,295 list, \$1,799 street) come bundled with a four-user version of Retrospect Remote for backing up small networks.

The PCPC DATStream is also designed for network backup, but it ships with PCPC's NetStream software rather than with Retrospect — if you're considering this one for your network, be sure to check out our August '91 network-backup story: In our tests, NetStream was fine in stand-alone mode, but the software was cumbersome to use on a network and network speed results weren't the greatest. PCPC promises that a new version of the software will be shipping by the time you read this — we recommend that you wait until it is.

The Relax 1.2 Gig Tape Vista is the only other of the top nine performers that doesn't have Retrospect bundled; its software, **SoftBackup-II**, from Diversified I/O, isn't as powerful as Retrospect, but we didn't have any problems with it. Speed differences among the top performers are insignificant, and we wouldn't hesitate to recommend any Archive/Retrospect bundle.

Table 1 Criteria

List price — The list price is the vendor's suggested retail price.

Street price — The street price is a typical actual price charged by dealers or mail-order companies during June 1991.

Mechanism — The manufacturer and model of the mechanism in the drive.

SCSI-ID selector — The control used to set the SCSI ID for the drive.

SCSI termination — Whether the SCSI-bus terminator is inside the case or outside it.

Recommended media — The class or brand of tape the vendor suggests you use with the drive.

Acceptable media — The brand or class of tape the vendor doesn't object to your using if the recommended media are unavailable.

Formats supported — The data-storage format the drive supports. DDS (Digital Data Standard) is the common format for DAT data storage.

Compression drive and price — The model name and price of a drive with compression built in, if the vendor offers one.

Cleaning frequency — The number of hours between necessary cleanings, if required.

Cleaning indicator — Does the drive have an indicator light to keep you aware of the drive's need for cleaning? Self-cleaning drives don't require such an indicator.

Read after write — Does the drive immediately read the data it has just written, without reversing the travel of the tape?

90-meter-tape support — Does the vendor approve of use of this longer but thinner tape in the drive?






Fan — Does the drive contain a cooling fan?

System 7 support — Is the drive's backup software compatible with System 7? Retrospect 1.2 isn't, but Retrospect 1.3 is — and the upgrade is free.

Back up AppleShare vols. — Can the software and hardware read server-based data on a client machine (as opposed to backing up the entire server or doing client/server backup on the network)?

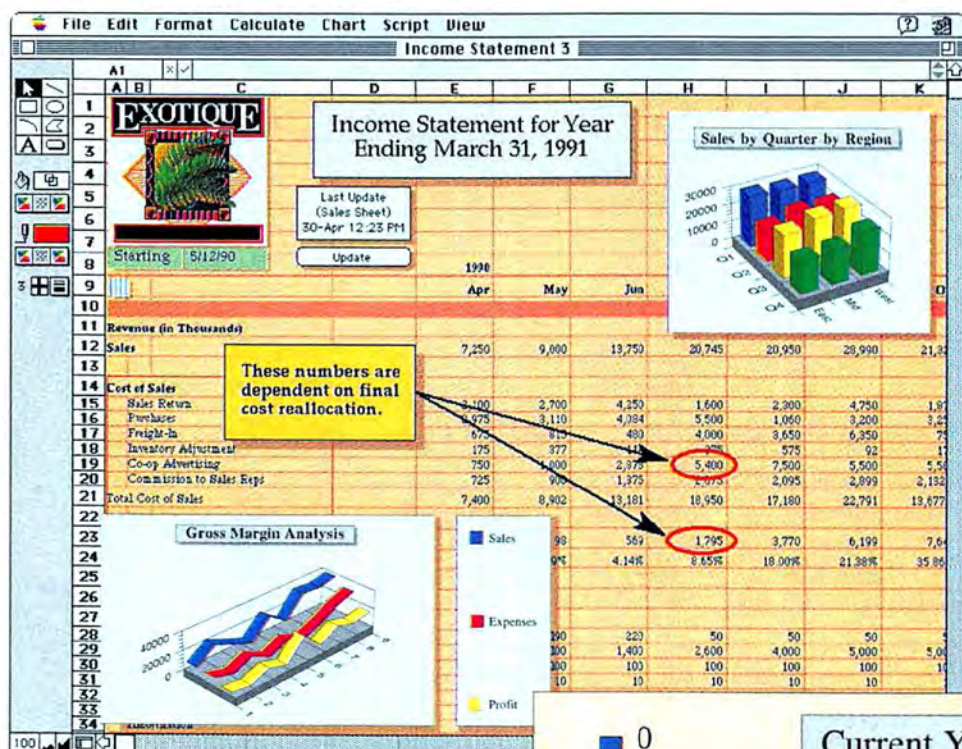
Backup software — Bundled software for backing up and restoring files.

Table 1: Features of DAT Drives

					
● = yes ○ = no	ADIC MacBack DAT \$\$\$	APS Archive Python \$\$\$\$	CMS Platinum DAT \$\$\$	DynaTek DAT 1300 \$\$\$\$	EMAC Metro DAT \$\$\$\$
List price	\$4,995	\$1,499	\$3,399	\$1,795	\$2,995
Street price	\$4,495	\$1,499	\$2,899	\$1,495	\$2,085
Pros	Solidly built. Easy-to-use software.	Fast. Inexpensive. Compact case.	Excellent hardware manual.	Fast. Inexpensive.	SCSI Sentry protection also provides termination power for Mac Plus.
Cons	Slow. Expensive. Heavy. Oversized case and power supply.		Limited software. No activity log.		Poor performance in incremental-restore tests.
Hardware					
Mechanism	HP 35450-67901	Archive 4330	WangDAT 1300	Archive 4520NT	WangDAT 1300
SCSI-ID selector	dial	push button	push button	push button	push button
SCSI termination	external	external	external	external	external
Recommended media	3M	Sony, Maxell	Maxell	data-grade DAT	Maxell
Acceptable media	Sony, TDK (data-grade)	any premium-brand DAT	Sony	any 60-meter DAT	Maxell
Formats supported	DDS, Data/DAT	DDS	DDS	DDS	DDS
Compression drive and price	none	WangDAT 2600, \$1,999	none	DAT 2600, \$2,095	none
Cleaning frequency	25 hours	10 hours	200 hours	20 hours	200 hours
Cleaning indicator	●	○	○	○	○
Read after write	●	●	●	●	●
90-meter-tape support*	○	●	●	●	○
Fan	●	●	●	●	●
Software					
System 7 support	○	●	●	●	●
Back up AppleShare vols.	●	●	●	●	●
Backup software	MacBack 2.02	Retrospect 1.2	AD-Mac Backup 1.1	Retrospect 1.2	Retrospect Remote 1.2
Other					
Dimensions (L x W x H)	14.5 x 10.5 x 5.5 in.	9.3 x 5.3 x 3.4 in.	11 x 10 x 3 in.	9.8 x 9.8 x 2.3 in.	10.7 x 9.7 x 2.8 in.
Weight	12 lb	4.7 lb	7 lb	7 lb	7 lb
Case material	metal	plastic	plastic	plastic	plastic
Warranty	1 year	2 years	1 year	1 year	2 years
Company	ADIC 14737 N.E. 87th St. Redmond, WA 98073 (800) 336-1233 (206) 881-8004	APS 2900 S. 291 Hwy. Independence, MO 64057 (800) 233-7550 (816) 478-8300	CMS Enhancements 2722 Michelson Dr. Irvine, CA 92715 (714) 222-6000	DynaTek Automation Systems, Inc. 15 Tangiers Rd. Toronto, Ontario M3J 2B1 Canada (416) 636-3000	EMAC 48431 Milmont Dr. Fremont, CA 94538 (800) 821-0806 (415) 683-2155

*Most mechanisms will support 90-meter tape by the time you read this.

The only thing missing from our new spreadsheet is the learning curve.



Application

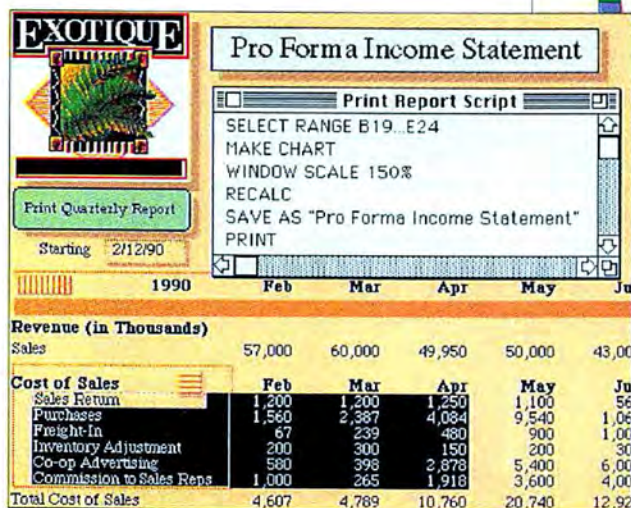
MacWrite II
FileMaker Pro
Clarisc Resolve
MacDraw Pro
MacProject II
Clarisc CAD
SmartForm Series
HyperCard
MacPaint

A Family of Applications.

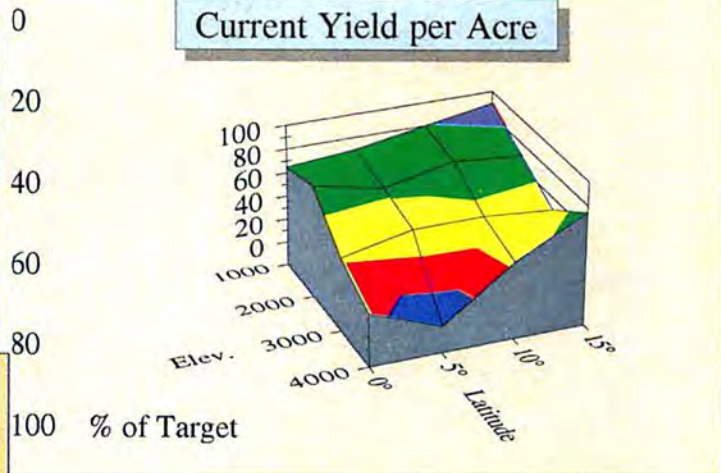
New Resolve joins the Clarisc family of System 7 software. Software that makes you more productive, because it shares a common interface, tools and commands.

So, You Want It All Now.

With a billion cells and 149 advanced business functions, Resolve is powerful enough to meet your spreadsheet needs now and in the future. Yet its power is readily accessible—for example, zooming, so you can choose to see the forest or the trees.



Current Yield per Acre

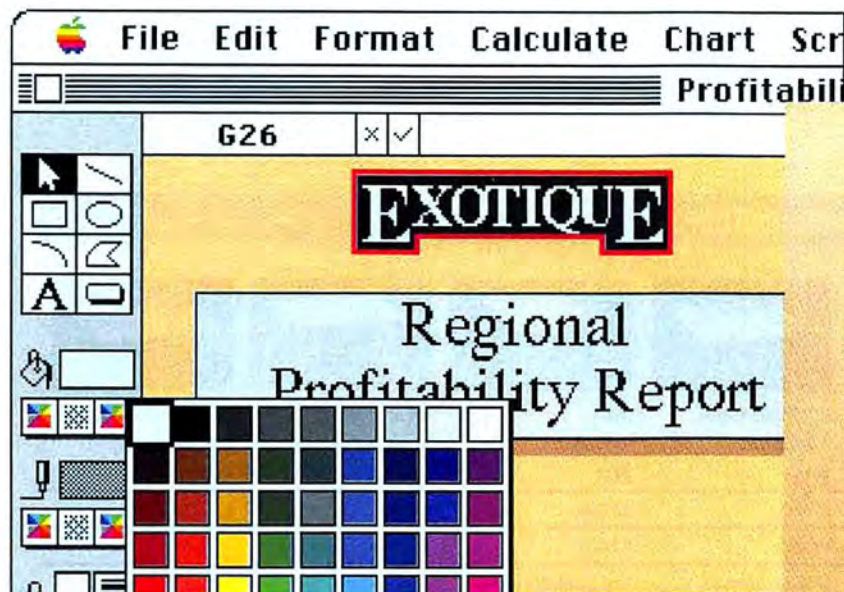


Effortless Graphs.

Making charts and graphs with new Resolve is so easy it makes your head spin. Select your data. Select one of 25 chart types and the results appear before your eyes.

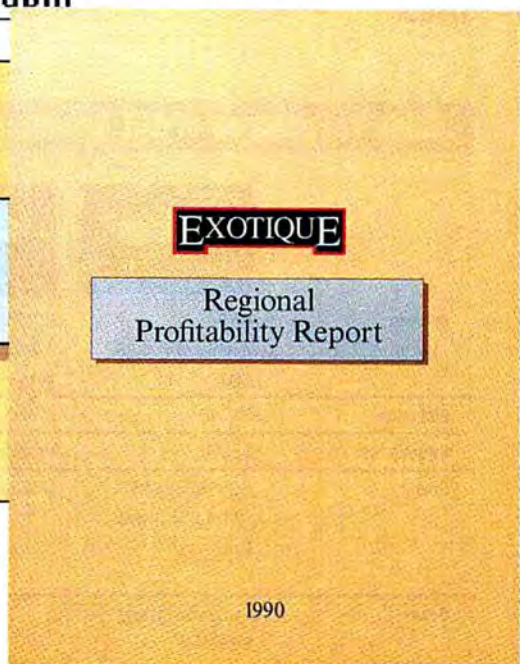
The Ultimate Scripting Tools.

For power users, the Resolve scripting language provides a fully structured development environment, to create ingenious, customized applications. For new users, Resolve automatically writes a script by recording your actions. One click on the assigned button automatically triggers the script.



Finished in a Flash.

Create graphics and handle text with tools you're already comfortable with. Select colors from the 81-color palette. Your important presentations have never been easier to prepare.



The System 7 Spreadsheet

Introducing Claris Resolve.



A spreadsheet was never the sort of thing to inspire fantasies. But then along came the new Claris® Resolve™ spreadsheet.

For the first time, Resolve lets spreadsheet power flow to your fingertips freely and intuitively. It utilizes interfaces, tools and commands familiar to anyone who's ever used a Mac. Nothing comes between you and complete spreadsheet performance.

Resolve is packed with clever, interactive features that help people quickly get their footing. Like context-sensitive help. Automatic scripting. One-step charting. Instant zoom-in and zoom-out. Even a built-in spell checker.

But lurking just beneath the surface are enough tricks to inspire any power user. 149 built-in functions to help solve any business problem. 25 kinds of charts and graphs to excite the most jaded audience. Elegant, built-in database functions so you can swiftly access your data. And advanced analytical solutions to impress the math wizards.

Here's just one example of the outstanding design of Resolve. With Resolve, you can modify graphs directly in your spreadsheet. You don't have to switch back and forth between spreadsheet and

chart modes. Think of the time savings. Not to mention the ease.

Yet, perhaps the most shining quality of Resolve is how it exploits System 7's most powerful functionalities—*Publish & Subscribe* and *Inter-Application Communication*. With Resolve, you can put charts in other documents and files and link them dynamically—so when you change any information in the spreadsheet, all the linked charts change as well. What's more, you can create *hybrid solutions*, like creating a HyperCard® program to access a database, send data to Resolve, and create and display a chart. All automatically.

New Resolve is the latest addition to the Claris family of software for System 7—a new generation of applications that work together more simply, more powerfully, more gracefully than any software for the Macintosh ever has before.






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Table 1: Features of DAT Drives, continued

					
● = yes ○ = no	FWB HammerDAT 1.3G ★★★★	HDI POWERDrive 1.3 Gig DAT ★★★★	Irwin 9131Se ★★★★	MacProducts MagicTape 1.3GB ★★★	MacTel INDEX 2.0 GB DAT ★★★★
List price	\$3,699	\$1,495	\$3,696	\$1,895	\$1,799
Street price	\$2,900	\$1,495	\$3,400	\$1,795	\$1,799
Pros	Bundled with fast FWB software and Retrospect.	Fast. Inexpensive.	Fast. Compact case.	Inexpensive. Convenient front-switched outlets on rear of case.	Fast. Inexpensive.
Cons	Confusing manual. Expensive.		Expensive.	Slow.	
Hardware					
Mechanism	WangDAT 1300	Archive 4520NT	Archive 4330	WangTek 6130FS	Archive 4520NT
SCSI-ID selector	push button	push button	push button	push button	thumb wheel
SCSI termination	external	internal	external	external	internal
Recommended media	FWB	Sony	Sony, Irwin	Maxell HS-4/60	Sony
Acceptable media	data-grade DAT	data-grade DAT	data-grade DAT	Maxell	TDK
Formats supported	DDS	DDS	DDS	DDS	DDS
Compression drive and price	HammerDAT 2.6G, \$4,295	none	none	MagicTape 2.6GB, \$1,895	none
Cleaning frequency	self-cleaning	8 hours	8 to 10 hours	20 hours	50 hours
Cleaning indicator	NA	○	○	○	●
Read after write	●	●	●	●	●
90-meter-tape support*	●	○	○	○	○
Fan	●	●	●	●	●
Software					
System 7 support	●	●	●	●	●
Back up AppleShare vols.	●	●	●	●	●
Backup software	HammerBackup 1.1E Retrospect Remote 1.2	Retrospect 1.2	Retrospect 1.2	Retrospect 1.2	Retrospect 1.2
Other					
Dimensions (L x W x H)	9.8 x 9.5 x 2.3 in.	9.8 x 9.8 x 4 in.	9.3 x 5.3 x 3.4 in.	11.2 x 10.3 x 4.2 in.	7.9 x 5.7 x 1.6 in.
Weight	6 lb	6.7 lb	4.7 lb	9.5 lb	4.7 lb
Case material	metal	metal	plastic	metal	plastic
Warranty	1 year	1 year, 30-day MBG	1 year	1 year, 30-day MBG	1 year
Company	FWB, Inc. 2040 Polk St., Ste. 215 San Francisco, CA 94109 (415) 474-8055	HDI 1912 W. Fourth St. Tempe, AZ 85281 (800) 767-3475 (602) 350-1128	Irwin Magnetic Systems, Inc. 2101 Commonwealth Blvd. Ann Arbor, MI 48105 (800) 421-1879	MacProducts USA 608 W. 22nd Austin, TX 78705 (800) 622-3475 (512) 343-9411	MacTel Technology 3007 N. Lamar Austin, TX 78705 (800) 950-8411 (512) 451-2600

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Table 1: Features of DAT Drives, continued

					
● = yes ○ = no	MicroNet CPKD-2000 ★★★★	PCPC DATStream ★★★★½	Peripheral Vision PV-DAT ★★★★	PLI PLI DAT Drive ★★★	Procom MDAT1300/M ★★★★
List price	\$2,995	\$3,995	\$2,295	\$2,795	\$3,795
Street price	\$2,000	\$2,195	\$1,799	\$2,450	\$2,500
Pros	Fast. Smallest case.	Fast and easy-to-use stand-alone backup.	Fast.	Well-organized manual.	Brief, easy-to-read manual.
Cons		Slow and hard-to-use network backup. Confusing manual.		Slow.	
Hardware					
Mechanism	Archive 4320NT	Archive 4330	Archive 4520NT	WangTek 6200HS	WangDAT 1300
SCSI-ID selector	push button	push button	push button	dial	dial
SCSI termination	external	external	external	external, switchable	external
Recommended media	TDK	Sony	Peripheral Vision	WangTek, DicDat	Procom
Acceptable media	data-grade DAT	data-grade DAT	Maxell	WangTek/Sony, JVC, Fuji	TDK, Maxell
Formats supported	DDS	DDS	DDS	DDS	DDS
Compression drive and price	MD-5000, \$3,795	DATStream 2, \$3,995	none	none	none
Cleaning frequency	once a month	30 hours	10 hours	self-cleaning	200 hours
Cleaning indicator	○	○	○	NA	○
Read after write	●	●	●	●	●
90-meter-tape support*	○	●	○	●	○
Fan	○	●	●	●	●
Software					
System 7.0 support	●	●	●	●	●
Back up AppleShare vols.	●	●	●	●	●
Backup software	Retrospect Remote 1.2	NetStream 2.0.4†	Retrospect Remote 1.2	Retrospect 1.2	Retrospect 1.2
Other					
Dimensions (L x W x H)	7.8 x 6.3 x 2.3 in.	9.3 x 5.3 x 3.4 in.	10 x 10 x 2 in.	9.8 x 9.8 x 2.4 in.	10.3 x 9.7 x 2.3 in.
Weight	3 lb	4.7 lb	9 lb	6 lb	10 lb
Case material	plastic	plastic	plastic	metal	plastic
Warranty	1 year	2 years	2 years, 30-day MBG	1 year, 30-day MBG	1 year
Company	MicroNet Technology, Inc. 20 Mason Irvine, CA 92718 (714) 837-6033	PCPC 4710 Eisenhower Blvd. Bldg. A-4 Tampa, FL 33634 (800) 622-2888 (813) 884-3092	Peripheral Vision Storage 2333 Fairmount Ave. Philadelphia, PA 19130 (800) 800-7868	PLI 47421 Bayside Pkwy. Fremont, CA 94538 (800) 288-8754	Procom Technology, Inc. 200 McCormick Ave. Costa Mesa, CA 92626 (800) 800-8600 (714) 549-9449

*Most mechanisms will support 90-meter tape by the time you read this.

†PCPC plans to bundle NetStream 2.1 in the near future.

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I've seen their frustration, have empathized with their confusion, and understood their computer fears. I've talked to workers who have had new computers and new programs simply dropped on their desk with the directive to, "learn this." I've listened to people who have struggled night after night trying to read and understand a computer manual. Can you imagine trying to understand and master 4th Dimension from the manual?

You would be surprised at the number of people who have confided with me the fact that they've given up trying to learn some of the programs. They put the box on the shelf and write the expenditure off as a bad investment.

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Works Database 3	
Works Spreadsheet 4	
FileMaker Pro Part 1	
FileMaker Pro Part 2	
FileMaker Pro Part 3	
Word 4.0 Part 1	
Word 4.0 Part 2	

Table 1: Features of DAT Drives, continued

				
● = yes ○ = no	Relax 1.2 Gig Tape Vista \$\$\$½	Tecmar DATaVault \$\$\$½	Third Wave DATadrive 2.0 GB \$\$\$	TTI CTS-4M \$\$\$
List price	\$1,448	\$4,995	\$1,650	\$2,595
Street price	\$1,448	\$3,900	\$1,650	\$2,595
Pros	Fast. Inexpensive.	Sturdy.	Inexpensive.	Easy-to-use software.
Cons	Limited software features.	Heavy.	Slow.	Limited software features. Heavy.
Hardware				
Mechanism	Archive 4520NT	WangTek 6130FS ⁵	WangTek 6130HS	WangDAT 1300
SCSI-ID selector	push button	push button	push button	dial
SCSI termination	external	external	internal; external, \$19	external
Recommended media	Maxell, Verbatim	Tecmar	Maxell, TDK, Sony	TTI
Acceptable media	Maxell, Verbatim, Sony, 3M	Maxell, TDK	data-grade DAT	Maxell, TDK
Formats supported	DDS	DDS	DDS	DDS
Compression drive and price	none	none	none	CTS-4M Plus, \$2,995
Cleaning frequency	50 hours	self-cleaning	self-cleaning	30 days
Cleaning indicator	●	NA	NA	○
Read after write	●	●	●	●
90-meter-tape support*	●	●	●	○
Fan	●	●	●	●
Software				
System 7 support	●	●	●	●
Back up AppleShare vols.	●	●	●	●
Backup software	SoftBackup•II 4.06	QTBackup 2.04	Retrospect 1.2	Nightshift 1.5
Other				
Dimensions (L x W x H)	11 x 10 x 2.5 in.	14.8 x 7.1 x 4 in.	9.5 x 9.5 x 2.5 in.	11 x 6 x 2 in.
Weight	10 lb	14 lb	8 lb	15 lb
Case material	metal	metal	plastic	metal
Warranty	2 years	2 years	1 year, 30-day MBG	1 year, 90-day swap
Company	Relax Technology, Inc. 3101 Whipple Rd. Union City, CA 94587 (415) 471-6112	Tecmar, Inc. 6225 Cochran Rd. Solon, OH 44139 (800) 624-8560 (216) 349-0600	Third Wave Computing 1826 B Kramer Ln. Austin, TX 78758 (800) 284-0486 (512) 832-8282	TTI 5401 E. La Palma Ave. Anaheim, CA 92807 (714) 693-7707

* Most mechanisms will support 90-meter tape by the time you read this.

⁵Will be upgraded soon.

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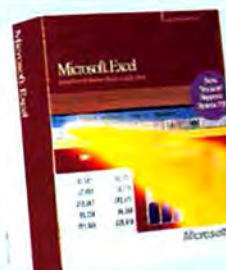


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Certainly, digital audio and video tapes are important technological advancements—ones with very promising futures in sound recording and home entertainment.

However, considering reliability, compatibility, efficiency and cost-effectiveness,

with most installed QIC-formats, 4mm is still evolving toward a standard format.

Data cartridge technology is designed for data.

Each data cartridge is a fully-enclosed tape transport system. You can feel the difference in construction. From its rigid, stippled metal baseplate to the durable plastic shell, the data cartridge is ideally suited for the demands of daily use—no matter how rugged the environment.

The difference in drive construction

old files to a new format. Converting to a digital audio tape system means copying old tape files to hard disk; then from hard disk to tape—at a rate of 90 minutes per gigabyte. Not only is the extra file conversion time involved an added expense, the cost of a digital audio tape drive is significantly more than a QIC-1350 drive.

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For 20 years major manufacturers have endorsed data cartridge technology through new product introductions

Data Cartridge Or 4mm/8mm Tape Technology: One is a better solution.

we believe data cartridge storage systems offer a better solution for data back-up and storage applications.

Here's why.

The full potential of data cartridge technology is still expanding.

Data cartridge technology has an industry endorsed potential migration path to 12 gigabytes and beyond.

Our new 3M Magnus™ 1.35 gigabyte data cartridge is the next step into a whole new decade of capacity and speed increases. A positive step—taken without the loss of backward compatibility or the cost of converting to an entirely new format.

The preferred standard by over 6 million users.

When it comes to storing and protecting important data, there are more data cartridge drives in use around the world than all other types of tape drives combined. Over 6 million users expect the continued compatibility of data cartridge technology—now and in the future.

You can, too, because of the standardization efforts of an organization called Quarter-Inch Cartridge Drive Standards, Inc. (QIC).

As a result, the new QIC-1350 systems will be backward compatible

is even more significant in terms of simplicity and reliability.

A data cartridge system uses one motor compared to both 4mm and 8mm systems which have at least three motors, far more parts and a rotating head that spins faster than 1,800 rpm. While average head life expectancy on a gigabyte data cartridge system is well over 8,000 hours, the head life expectancy for a digital audio tape system is significantly less.

Why give up faster transfer speed for the same file access speed?

Backing up one gigabyte of data on a QIC-1350 system is three times faster than on a 1.3 Gb 4mm digital audio tape system. Twice as fast as a 2.3 Gb 8mm video system.

And since data cartridge tape is always in a ready standby mode, the file access speed is about the same for 4mm and much faster than 8mm tape.

Backward compatibility shouldn't be an added expense.

Backward compatibility will continue to be a strength of data cartridge technology.

As it evolves, your existing data cartridge files will continue to be easily accessible—with no need to convert

like the IBM AS/400, the COMPAQ SYTEMPRO and the Sun Microsystems family of workstations. No other tape technology has anywhere near as large a support group of manufacturers.

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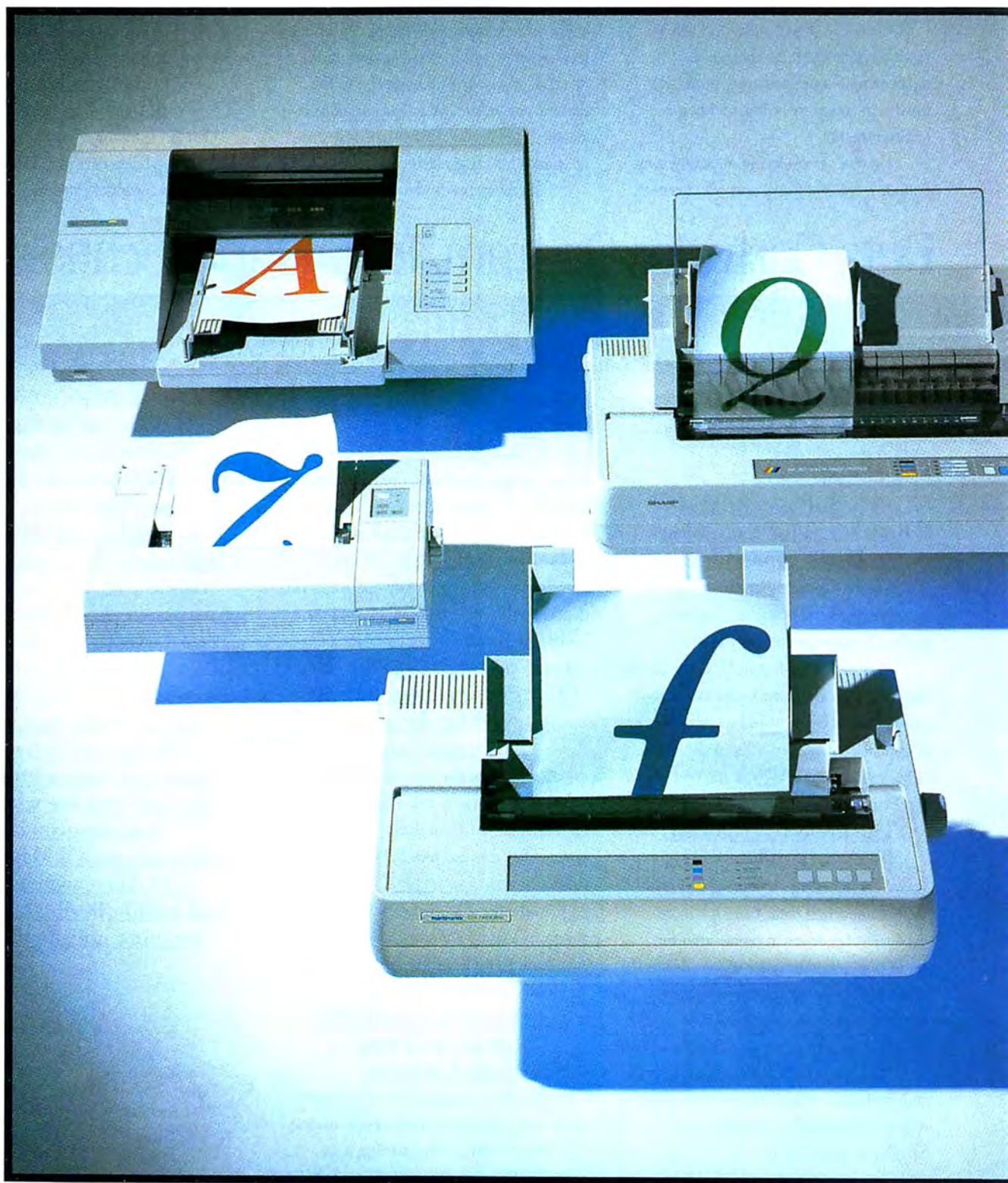
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The Affordable Rainbow: Color Inkjet Printers

Is your screen in color but your printer still limited to black-and-white? We tested four printers that prove that price is no longer a barrier to colorful output.



**BY PAUL YI AND
THE MACUSER
LABS STAFF**



ou can do wonders with your color Mac: cook up eye-popping pie charts, spruce up full-color photos, create multihued layouts that leave *USA Today* in the shade. But even your most blinding color creations look like the *Wall Street Journal* when they emerge from a monochrome printer. Without a color printer, you're using only half of your color potential — and color confined to your screen is hard to share. The most effective way to distribute your color creations is in print — and with a color inkjet printer, you don't have to give up a lot of green to get 16 million colors.

Color inkjet printers also have a few advantages over other color printers such as the thermal-wax printers that use Adobe's PostScript page-description language. They're less expensive to purchase, for example, and thermal-wax prints are two to four times as expensive to produce (see "Easy Hard Copy: Color PostScript Printers," May '91, Buyer's Guide page 38). Color inkjet printers can also be as fast as — if not faster than — thermal-wax printers, and inkjet-output quality can often rival that of thermal-wax prints. The quality of inkjet prints doesn't come close to that of sublimadye and color laser prints, but the high cost of the sophisticated printers needed to produce the latter two confines them to the most-demanding art and design departments.

One significant drawback of affordable color inkjet printers is their lack of on-board PostScript — the industry-standard PDL (page-description language). On-board PostScript lets a printer — instead of the Mac — perform the page processing. The four printers reviewed here tie up the Mac during printing.

All PostScript printers have LocalTalk built in so they can be shared easily over a network. Only one of these inkjet printers comes with LocalTalk, but because it still ties up the Mac, sharing is unlikely. PostScript's powerful graphics capabilities are also a must for desktop publishers who need to produce color comps, or test images. But if you're printing presentation materials and you don't plan to share your color printer over a network, an inkjet printer offers the best bang for the buck. You can also get third-party PostScript software emulators for the inkjet printers.

We tested four color inkjet printers that each sell for much less than the \$3,100 list price of the cheapest color Mac — the LC with Apple's 12-inch RGB monitor. Two of the printers return from last year's color-printer roundup (see "Color on the Page," May '90, Buyer's Guide page 56), and the other two are improvements over

last year's models. The Sharp JX-730 Color Ink Jet and Tektronix ColorQuick return unchanged, except that the JX-730 can now print on transparencies. Last year, the Sharp JX-730 Color Ink Jet, with its resolution of 180 dpi (dots per inch) disappointed us because of its slow speed and poor paper handling. In contrast, the Tektronix ColorQuick's excellent image quality made it last year's top inkjet pick. The ColorQuick uses the same engine as the JX-730 but has 216-dpi resolution. Tektronix also uses its own ink formulation and includes the most-sophisticated color-matching software available on any color printer, including expensive high-end ones.

Hewlett-Packard's 180-dpi PaintWriter and PaintWriter XL are improved versions of the PaintJet and PaintJet XL printers. The PaintWriters ship with newly formulated inks that produce brighter, more saturated output, especially on transparencies. HP is now shipping its own software that provides color matching between your monitor and the printer — last year's models used a software driver from Palomar. The PaintWriter is the lowest-priced Mac color printer, at less than \$1,000. Its much larger sibling, the PaintWriter XL, uses a faster engine and can print on 11-x-17-inch paper. It's also the only networkable inkjet printer — it comes with a LocalTalk and a serial connection.

We tested the inkjet printers for

printing speed and image quality. To compare these printers with the low end of Mac color printing, we also ran our benchmark tests on a 144-dpi Apple ImageWriter II, using a color ribbon and Microspot's MacPalette software — the cheapest way to get color prints. Although we were surprised at the quality of the dot-matrix output (see the "Really Cheap Color" sidebar), the output isn't very likely to impress your boss or clients. Also, an ImageWriter II can't print on transparencies — a fatal flaw for a business-presentation printer.

Finally, to compare the inkjet printers' performance with that of color PostScript printers, we ran the benchmark tests on the average-speed, 300-dpi Tektronix Phaser IIPX, a new version of this year's thermal-wax image-quality champ. A color PostScript thermal-wax printer such as the Phaser IIPX offers good image quality on paper as well as on transparencies, and it prints LaserWriter-quality text. However, most thermal-wax printers cost around \$8,000. The inkjet printers in this report compare quite favorably in many categories, and you can buy several for your department for the cost of one thermal-wax printer.

Ink Shots

The name *inkjet* describes how these printers work: They squirt ink onto paper. There are, however, two different ways to do this. The two HP



Figure 1: The Hewlett-Packard PaintWriter and PaintWriter XL use disposable cartridges that contain ink reservoirs and print heads. With the Sharp JX-730 Color Ink Jet and Tektronix ColorQuick, you refill ink from individual vials. Each vial is shape-coded so only the correct color fits into the appropriate socket.

Really Cheap Color

Our search for affordable color printing led to an almost forgotten printer: the venerable Apple ImageWriter II. When equipped with a four-color ribbon and linked to Microspot's MacPalette II driver software, the ImageWriter II can pass as a pretty decent low-cost dot-matrix color printer.

Like all color-printer drivers, MacPalette II (\$69) uses dithering, a method of laying down dots of cyan, magenta, yellow, and black to create the illusion of many colors. Your eye mixes these patterns of dots into a color image.

MacPalette uses a Bayer dither, an orderly dot pattern. Considering the low 144-dpi resolution of the ImageWriter, the results are remarkable: You can create ranges in color tone from light to dark. The results are less impressive for a complex color image such as a scanned photo, but for a simple business graphic such as a pie chart, what you get is amazingly close to what you see on-screen.

To use MacPalette II, simply select it in the Chooser and access the driver through the Page Setup and Print commands in any Mac application. The interface for this printer driver is one of the friendliest around. On-line help is displayed in an information window at the bottom of the Page Setup and Print dialog boxes. As you move the mouse over a particular option button in either dialog box,

information about that option appears. You can turn the instant help off at any time.

A network version is available for an ImageWriter II connected to LocalTalk. Microspot sells color ribbons for \$19.95. Microspot, 20421 Stevens Creek Blvd., Suite 240, Cupertino, CA 95014; (408) 253-2000.



Microspot's MacPalette software and a four-color ribbon turn the Apple ImageWriter II into the most affordable color printer.

printers use a *bubble-jet* engine. The print head and ink reservoirs are integrated into a single compact, disposable cartridge (see Figure 1). Ink is heated and vaporized through 30 small nozzles on the cartridge head. An advantage of this system is that any clogged cartridge can be replaced with a new one. The PaintWriter uses a black cartridge and one color cartridge containing three colors. The disadvantage of this system is that you have to throw the color cartridge away if one color is depleted. The PaintWriter XL, on the other hand, uses individual cartridges for all three colors and black.

The Sharp JX-730 Color Ink Jet and Tektronix ColorQuick don't use disposable cartridges — their permanent print heads use hydraulic pressure provided by a piezoelectric diaphragm to force ink onto the page. This method uses more ink. To prevent clogging, the JX-730 and ColorQuick perform a

five-minute cleaning cycle every time they're turned off — a process that also uses more ink.

As a result of their smaller print heads, the HP PaintWriters are much quieter than are the JX-730 Color Ink Jet and the ColorQuick. The larger, heavier piezoelectric heads cause a sawing noise and substantial shaking as the head changes direction. If you prefer peaceful environments, you may opt for the HP printers.

Another concern is the printer's *footprint*, or area of the desktop that it monopolizes. The PaintWriter is the most amenable to limited desk space, with about the same footprint as the ImageWriter II but a lower profile. The PaintWriter XL is large enough to be a nuisance — it occupies more than twice the acreage of the PaintWriter. Luckily, it can be connected to a LocalTalk network and left on its own desk. The ColorQuick and JX-730 Color Ink Jet also require fairly hefty

real estate investments, but neither is as bulky as the 520-square-inch PaintWriter XL.

Drop by Drop

All the inkjet printers use four inks — cyan, magenta, yellow, and black — to create the illusion of millions of colors. Dots of these colors are laid next to each other in patterns called *dithers*, and the interaction of the colors fools your eye into seeing shades that aren't really there. This process is the same as that used in most color printing, including the production of every color photo and illustration in this magazine — examine any image in this article with a powerful magnifying glass, and you can see what we mean.

Dithering is very effective (see Figure 3). But given the low resolution of these inkjet printers — 180 and 216 dpi — the illusion doesn't work on fine lines and text. Images in this magazine,

Figure 2: Speed of Color Inkjet Printers

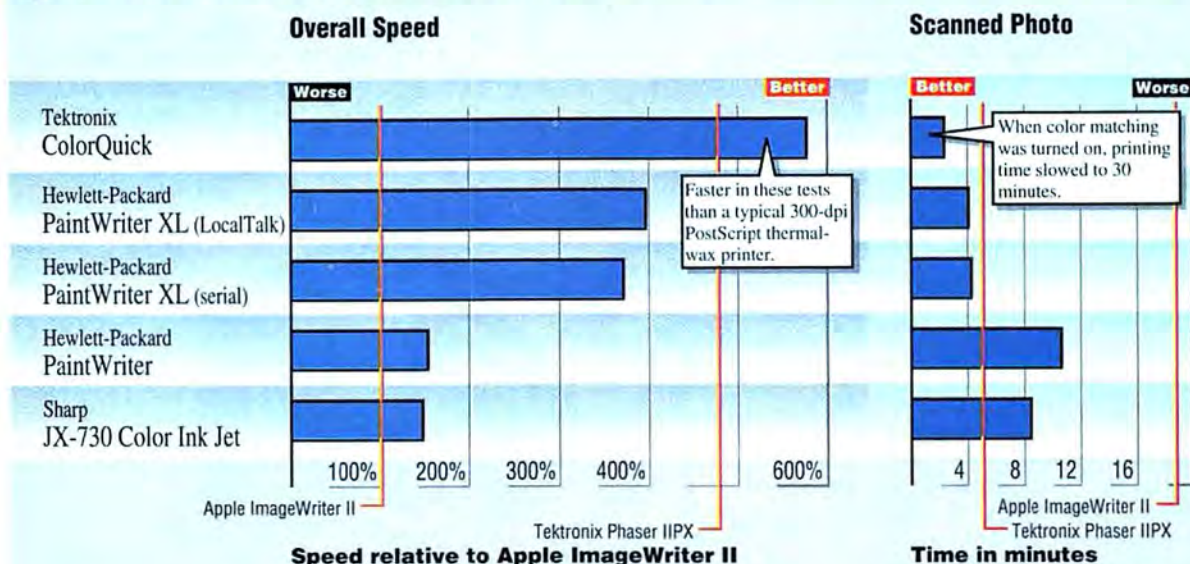


Figure 2: We tested each printer's speed when printing a scanned photo, a presentation graphic — printing on clay-coated paper as well as on transparencies — and a complex page layout. Because the Mac does all the image processing, we used a fast Mac, a IIfx. For reference, we tested the Tektronix Phaser IIPX (a representative color PostScript thermal-wax printer) and an Apple ImageWriter II using a color ribbon and Microspot's MacPalette software.

Overall Speed:

The Tektronix ColorQuick was nearly five times faster than the

color-capable Apple ImageWriter II — faster even than the Tektronix Phaser IIPX. At the other end of the speed spectrum was the Sharp JX-730 Color Ink Jet. Oddly enough, both printers share the same printing engine — the difference is in their driver software. The HP PaintWriter XL was more than twice as fast as the HP PaintWriter.

Scanned Photo:

The Tektronix ColorQuick breezed past its competition when printing this complex color image. As in all the tests, the Hewlett-Packard PaintWriter XL was slightly faster when communicating over

by contrast, are made up of four-color negatives, each printed at 2,540 dpi. Details are sharp and defined.

The nature of inkjet technology helps dithering. Ink bleeds — very slightly — into clay-coated paper, helping to blend the colors. All four inkjet printers require clay-coated paper, because plain paper is too porous and causes too much bleeding. Unfortunately, the need for clay-coated paper increases the cost per page of inkjet prints (see the "On the Horizon" sidebar).

Dither patterns themselves can be orderly or chaotic. Different dithers work better than others for various types of images. The HP PaintWriter and PaintWriter XL driver software offers three types of dither patterns: pattern, cluster, and scatter. The pattern dither puts down dots in an orderly manner. It works best on solid colors and large color patches where you

want the most uniform look. In scanned photos and more-complex color patterns, however, an orderly look makes the dither obvious, so you want a chaotic dither such as a cluster or scatter.

The Sharp JX-730 Color Ink Jet comes bundled with Cricket Expressions software, which offers eight dither patterns, ranging from the orderly Bayer to the chaotic Floyd/Steinberg. The eight dither options may be confusing initially, but once you understand their particular benefits, you'll appreciate the flexibility.

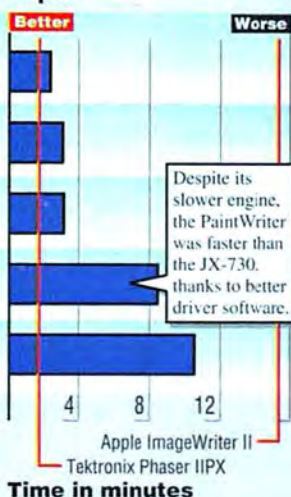
The Tektronix ColorQuick driver software has a single all-purpose proprietary dither pattern. This may seem to be a limitation, but our jury consistently rated the ColorQuick's images superior to those produced by the other inkjet printers. The Tektronix dither is excellent, and the ColorQuick's brilliant inks and saturated colors also

contributed to its success. The driver software doesn't come free, however. You also have to purchase the Mac Accessory Kit (\$150). Tektronix makes it worth your trouble by including manuals, 100 sheets of clay-coated paper, two vials of each of the four color inks, and a power cord in the kit (see Table 1).

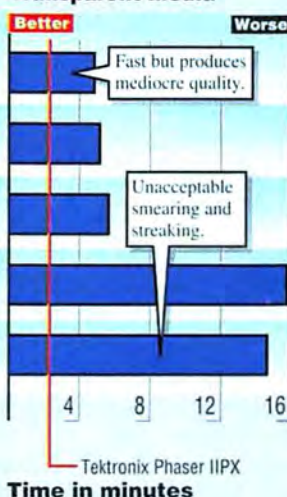
Three of the inkjet printers ship with outline fonts — the Tektronix ColorQuick does not. Because Apple's TrueType is bundled with System 7 and recognizing the popularity of ATM (Adobe Type Manager), most users will probably forgo the bundled fonts and use TrueType or ATM. In our tests, we used ATM and TrueType and their respective outline fonts.

The Hewlett-Packard PaintWriters and the Tektronix ColorQuick have color-matching capabilities built in to their driver software. Color-matching

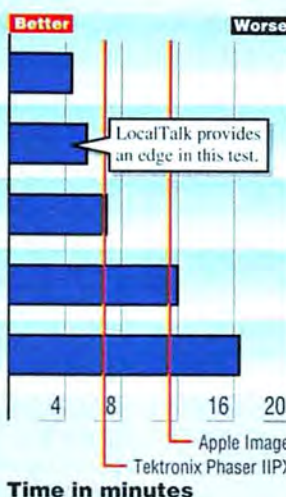
Presentation Graphic – Paper



Presentation Graphic – Transparent Media



Page Layout



Tektronix ColorQuick
Hewlett-Packard PaintWriter XL (LocalTalk)
Hewlett-Packard PaintWriter XL (serial)
Hewlett-Packard PaintWriter
Sharp JX-730 Color Ink Jet

a LocalTalk connection than with a serial connection.

Presentation Graphic — Paper:

The Sharp JX-730 Color Ink Jet's driver software, Cricket Expressions, is highly inefficient for printing the combination of text and graphics used in this typical business-presentation page.

Presentation Graphic — Transparent Media:

All the inkjet printers took about twice as long to print the presentation page on transparent media as they did to print it on paper. The HP PaintWriters print each line twice, and the Tektronix

ColorQuick and Sharp JX-730 simply print much more slowly so that their ink has sufficient time to be absorbed by the media.

Page Layout:

The 25-megahertz 68030 microprocessor in our host Mac IIci helped the Tektronix ColorQuick speed past the thermal-wax Tektronix Phaser IIPX, which performed its image processing with an on-board 16-megahertz 68020. The Sharp JX-730 was slowest when printing the complex page layout, showing that its software driver is the least efficient of the group.

Figure 3: Color in a Dither

Figure 3: To create the illusion of millions of colors by using only four colors — cyan, magenta, yellow, and black — inkjet printers use a process called *dithering*. Different dithers are suited to different types of output and can also affect the color of the final image. Each

printer offers at least one dither pattern (shown at left at 100 percent and at right at 300 percent): The PaintWriter and PaintWriter XL offer three, the Sharp JX-730 Color Ink Jet offers eight, and the Tektronix ColorQuick has only one — but it's an excellent all-purpose dither.



Hewlett-Packard PaintWriter: cluster (chaotic)



Hewlett-Packard PaintWriter XL: pattern (orderly)



Sharp JX-730 Color Ink Jet: Floyd/Steinberg (chaotic)



Tektronix ColorQuick: proprietary



Figure 4: Image Quality

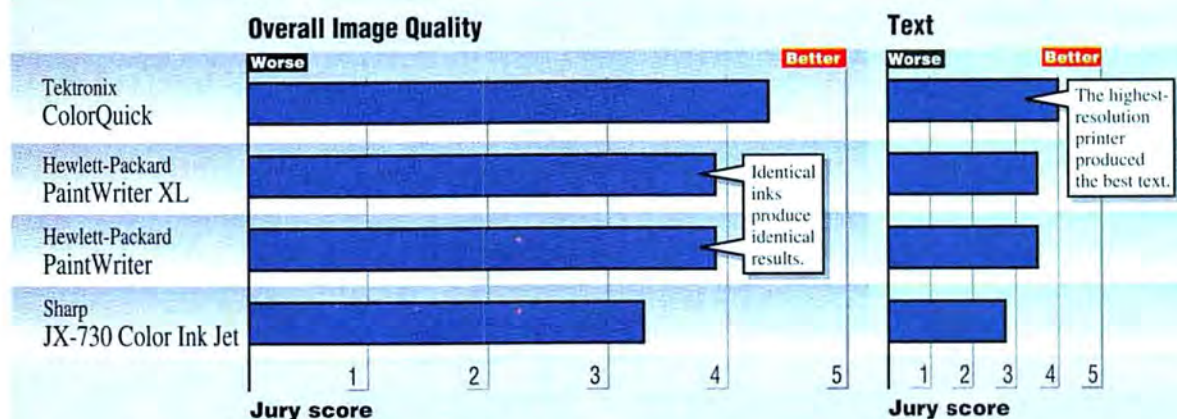


Figure 4: Inkjet printers produce prints whose quality ranges from good to very good — when printing on clay-coated paper. When they print on transparent media, the quality range broadens considerably.

In printing the test files, we used the full range of each printer's dithering capabilities and color-matching options; we chose the best-looking print that each printer produced. We then asked a jury of experts to judge the

text quality by scrutinizing the multiple fonts and point sizes in the page layout; color quality by examining the scanned photo, a 32-bit color ramp, and the presentation graphic; and the quality of transparent media by looking at the clarity and color of a presentation graphic. We also compared the inkjet printers' output with that of a color PostScript thermal-wax printer — the Tektronix Phaser IIPX — as the ideal and

with that of a color-capable ImageWriter II as a low-end reference.

Overall Image Quality:

The Tektronix ColorQuick, with its brilliant inks and saturated colors, was judged to produce the best image quality. The HP PaintWriter and PaintWriter XL produced prints of identically good quality.

Text:

The Tektronix ColorQuick, with its 216-

software attempts to narrow the difference between the colors you see on-screen and the colors that appear in print. A monitor uses additive colors and is transmissive — that is, it adds red, green, and blue together to create white and your eye views light passing through the colors. A color print, however, uses subtractive colors and is reflective — it subtracts cyan, magenta, and yellow from black to produce white and your eye views light reflecting off the colors. It's not surprising that on-screen colors often don't match what's printed.

Hewlett-Packard and Tektronix have developed algorithms that try to compensate for the differences and match their printers' output colors to those on your screen. You need to tell these printers what kind of monitor you're using, because different monitors have different color characteristics. The two PaintWriters and the ColorQuick have options in their drivers that let them accommodate several Mac monitors.

The PaintWriters simply try to match their colors to those of the chosen monitor. The ColorQuick has more-powerful options to either match what's on-screen or adjust for the white of the paper.

Matching colors requires complicated processing by your Mac, so printing slows down with complex color images. This is especially true with the Tektronix ColorQuick: Printing the scanned photo in one of our speed tests took 13 times longer with the color-matching option turned on. The PaintWriters' printing time increased by about a third. Some users may find that the color accuracy outweighs the speed penalty, but users who aren't as concerned with matching colors can opt for speed.

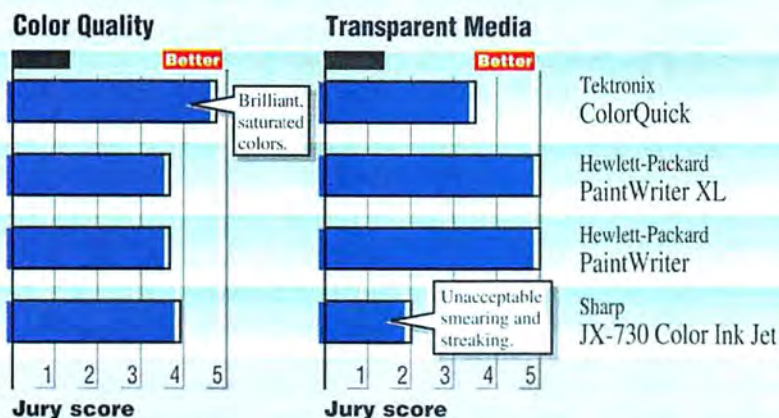
Mac the Host

The four color inkjet printers rely on the host Mac to perform the page processing, which ties it up during printing. Thermal-wax printers — as

well as the majority of monochrome laser printers — do the complex processing without help from the host Mac. PostScript thermal-wax printers, for example, have a Motorola 68020 or a RISC processor on-board as well as Adobe's PostScript page-description language — or a clone.

These inkjet printers have a Chooser-level software driver that uses the host Mac's processor and 32-bit QuickDraw to translate the on-screen color image into the dots of four colors that make up the page. This driver uses the Mac's internal graphics language, QuickDraw, to describe the color page, and the dithering is done by the driver software. If you have a Mac II, IIx, or IIcx, you need to add 32-bit QuickDraw to your System file (or to your Extensions folder if you're running System 7) before this process can work. The more recent Macs have 32-bit QuickDraw built in to ROM.

The HP PaintWriters use a serial cable to connect to the Mac. The



dpi resolution, produced the crispest text of these inkjet printers, but its output was still inferior to that of a 300-dpi laser printer. The other three printers' text quality was hampered by their 180-dpi resolution.

Color Quality:

The Tektronix ColorQuick's colors were the brightest and most saturated. The Sharp JX-730 Color Ink Jet's output was slightly richer than that of the HP PaintWriters.

Transparent Media:

The two Hewlett-Packard PaintWriters printed clear, sharp transparencies that had brilliant, saturated colors—as professional-looking as those produced by the Tektronix Phaser IIPX, a 300-dpi thermal-wax printer. The ink from the Sharp JX-730 Color Ink Jet smeared and ran, creating transparencies that were unacceptable for use in business presentations.

PaintWriter XL can also be hooked up to a network via a LocalTalk connection. The Tektronix ColorQuick uses a SCSI connection: You have to be aware of SCSI-termination and -ID problems, and you must keep the ColorQuick close to your Mac. You also have to provide your own cable—Tektronix doesn't sell any.

The Sharp JX-730 Color Ink Jet offers two Mac interfaces, but neither, unfortunately, is free. The Paralink serial-to-parallel converter cable, from Jonathan Freeman Technologies, sells for \$125, and a slightly faster option, the Hurdler II-CPI NuBus card, from Creative Solutions, sells for \$195. We used the Hurdler II-CPI interface to show the printer's fastest performance.

The JX-730 Color Ink Jet is sorely lacking in the paper-handling department. All the printers use a manual-feed method, and the PaintWriter XL and the ColorQuick also include automatic cut-sheet feeding. The PaintWriter lets you choose Z-fold feeding as well as manual feed. The Sharp JX-730, however, forces you to spend

Figure 5: Output Samples

Text:

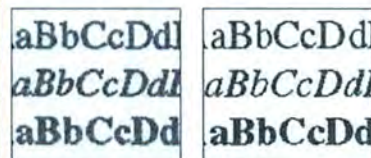
The quality of the text that a printer can produce is almost entirely dependent on the device's resolution. Text produced by a 144-dpi dot-matrix Apple ImageWriter II is jagged—far inferior to output from a 300-dpi LaserWriter IINTX. Among the inkjet printers, the 216-dpi Tektronix ColorQuick has an edge over the 180-dpi Hewlett-Packard PaintWriter.

Color Quality:

Color quality depends on the brightness and saturation of the four color inks. The inexpensive Apple ImageWriter II does a surprisingly good job with a color ribbon and MacPalette software. The inkjet printers compare favorably with a relatively expensive color PostScript thermal-wax printer, the Tektronix Phaser IIPX.

Transparent Media:

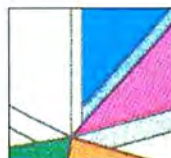
It takes the right combination of media and ink to render a bright image on transparencies. Hewlett-Packard has done it right with the PaintWriter and PaintWriter XL, in that their output looks just as good as that of the color PostScript thermal-wax printer. The Sharp JX-730 Color Ink Jet, on the other hand, hasn't found the right balance.



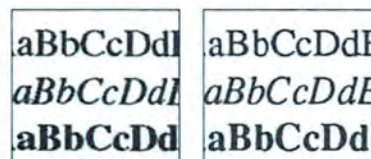
Apple ImageWriter II Hewlett-Packard PaintWriter



Apple ImageWriter II Sharp JX-730 Color Ink Jet



Hewlett-Packard PaintWriter XL



Tektronix ColorQuick Apple LaserWriter IINTX



Tektronix ColorQuick Tektronix Phaser IIPX



Sharp JX-730 Color Ink Jet



Tektronix Phaser IIPX

\$480 extra for a cut-sheet feeder.

One distinctive feature of the JX-730 Color Ink Jet is its ability to print on an image area as large as 13.6 x 21 inches — the largest print area of all the printers. The PaintWriter XL can print on B-sized (11 x 17 inch) paper and the ColorQuick on 12-x-18-inch paper, but the PaintWriter is limited to letter-sized paper.

Surprising Speed

In our speed testing, we timed the printing of three files representing the spectrum of common color printing: a scanned photo; a presentation graphic; and a page layout containing color images, text, and color graphics. We also printed the presentation graphic on transparent media and found that all the printers take significantly longer to print on transparencies than they do to print on paper.

The Tektronix ColorQuick — without color-matching turned on — was tops in overall speed, with the HP PaintWriter XL a distant second and the PaintWriter lagging in third place

(see Figure 2). We used the serial as well as the LocalTalk connection with the PaintWriter XL and discovered that LocalTalk works slightly faster than serial communication.

The slowest printer overall was the Sharp JX-730 Color Ink Jet. Although it has the same engine as the ColorQuick, its inefficient driver software slows its performance. The ColorQuick has an advantage in that it connects to the Mac via SCSI — a faster connection than the one provided by the Hurdler II-CPI.

As we went to press, Sharp announced a new software driver, ColorOut, which it claims will improve speed two to three times over that of the current Cricket Expressions driver. At this writing, the price wasn't set for this option, which includes six dither patterns.

Image Is Everything

High printing speed is meaningless if it's at the expense of image quality. To determine each printer's best image quality, we looked at all the dither

patterns for each printer. We also tested the HP and Tektronix printers with and without their color-matching options turned on. We chose each printer's best-looking output for each file type — a scanned photo, a presentation graphic printed on clay-coated paper as well as on a transparency, a 32-bit color ramp, and a page layout. We then assembled a jury of color-printing experts and had it judge the quality of the presentation graphic, the color quality of the scanned photo and color ramp, and finally the text quality of the page-layout file.

When printing on paper, the ColorQuick was the clear winner overall (see Figure 4). Its prints were the most saturated and realistic of the bunch. The JX-730 prints were brighter than those produced by the PaintWriters. The PaintWriters, with their improved inks, had strong — and identical — results in the transparency-quality evaluation. The JX-730 had poor transparency performance: Its ink spreads when more than one color is laid onto the transparent media.

On the Horizon

The color inkjet printers we tested for this report produce impressive images, but they have limited resolution and require special clay-coated paper. Hewlett-Packard's new color-capable DeskWriter C printer (\$1,095) removes these restrictions and ushers in a new age of affordable high-resolution plain-paper color printing.

The DeskWriter C is a color version of HP's immensely popular monochrome DeskWriter inkjet printer. Like the DeskWriter, the DeskWriter C prints at 300 dpi — a first for affordable color inkjet printers. That's LaserWriter-quality text — on paper or transparent media — in color, at a remarkably low price.

There is one slight drawback: Hewlett-Packard supplies two cartridges with the DeskWriter C: one with black ink and the other with cyan, magenta, and yellow ink. Only one cartridge can be used at a time. When printing a color page, the DeskWriter C is a three-color printer — not four-color like the inkjet printers tested in this report. When you're printing with the three-color cartridge, black text appears somewhat brown — if you're printing text, use the black-ink cartridge.

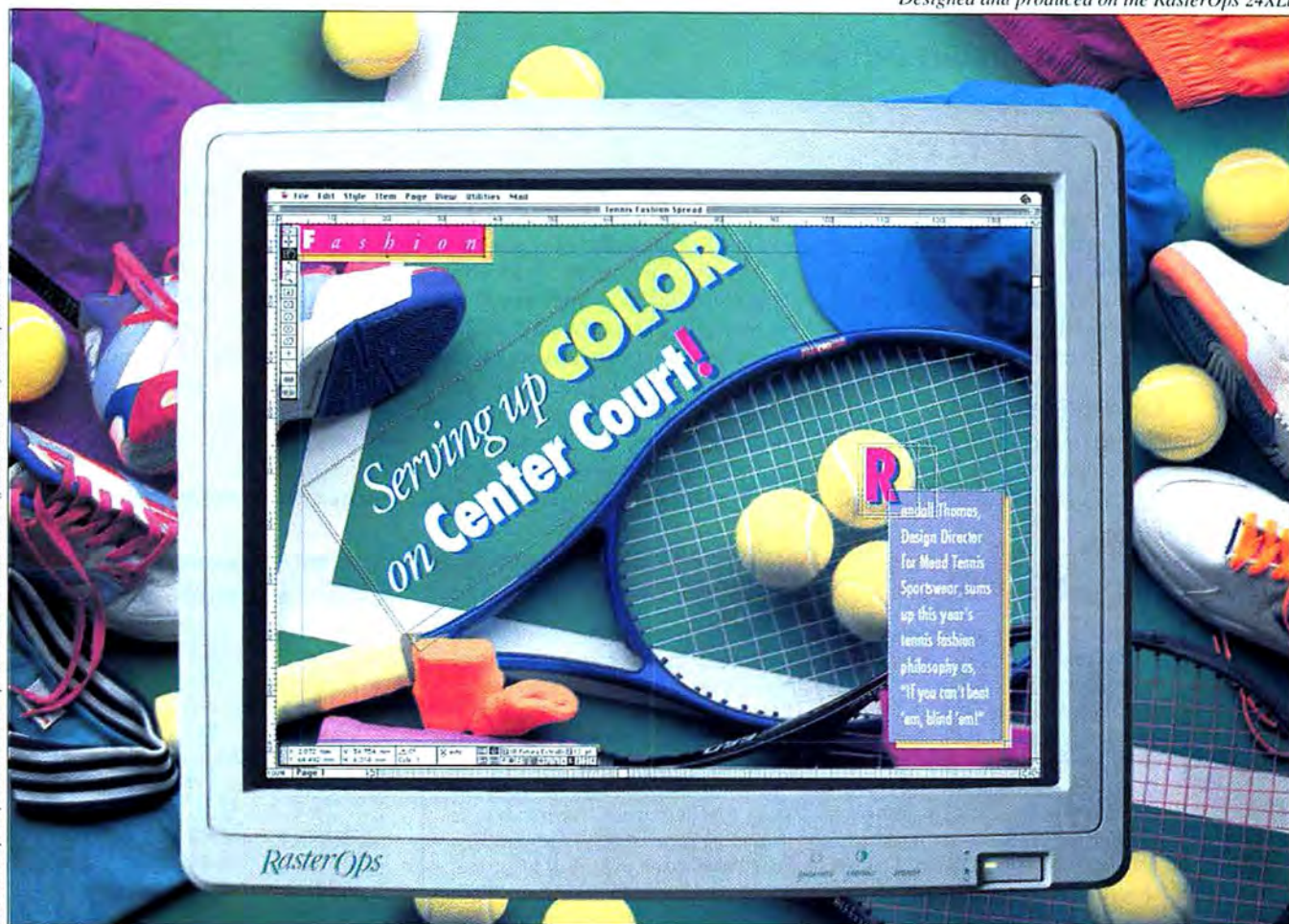
But given the obvious price and resolution benefits over existing color inkjet printers — including Hewlett-Packard's PaintWriters — the DeskWriter C might be the

color-printing breakthrough everyone has been waiting for. Hewlett-Packard Co., 19310 Pruneridge Avenue, Cupertino, CA 95014; (800) 752-0900 or (201) 529-9500.

To add to the competition posed by the Hewlett-Packard DeskWriter C, Kodak has introduced a plain-paper printer: the 192-dpi Diconix Color 4 (\$1,595). Although it's not as revolutionary as the DeskWriter C, the Diconix Color 4 is a compact, attractive four-color printer that can also print on transparencies. Eastman Kodak Co., 901 Elmgrove Road, Rochester, NY 14563; (800) 344-0006.



The 300-dpi Hewlett-Packard DeskWriter C introduces the next generation of high-resolution low-cost plain-paper color printing.



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The ColorQuick's high resolution helped it win the text-quality test, providing crisp, readable text. The PaintWriters also printed tolerable text, but the JX-730 Color Ink Jet was unable to produce letters without noticeable smudges and shadows.

Color for Everyone

Color printing — like high-quality color computing — is not the exclusive privilege of high-end publishing

anymore. Affordable color inkjet printers have made good-quality output accessible to almost any user.

A color inkjet printer's price is preferable to that of a higher-end color printer, and it also offers some advantages over more-expensive color technologies. Three of the color inkjet printers we tested can print on B-sized or larger paper, two are reasonably fast, and three can produce high-quality color prints and transparencies — all

at a low cost for each page.

Affordable color printing doesn't have to mean a great sacrifice in image quality or speed. Although inexpensive high-resolution plain-paper color printers are on the horizon, these four color inkjet printers offer unique features and options that make them attractive to anyone who's in the market for an entry-level color printer.

Paul Yi is a MacUser associate editor.

The Bottom Line

Three of the color inkjet printers in this report prove that *high quality* can be synonymous with *affordable*.

For graphics users demanding the highest-quality output at the lowest possible price, the clear choice is the **Tektronix ColorQuick** (\$2,345 list, \$1,800 street). It was our top pick in last year's color-printer roundup, and this year it again produced the brightest, most saturated prints. The ColorQuick was also the fastest printer and comes with the most-advanced color-matching software of any printer, TekColor — but be warned that printing is very slow with this option turned on. The ColorQuick uses a lot of ink, but once dry, the ColorQuick's output rivaled that of Tektronix's much-higher-priced color PostScript thermal-wax printer, the Phaser IIPX.

The Hewlett-Packard **PaintWriter** (\$995 list, \$750 street) and **PaintWriter XL** (\$2,595

list, \$1,800 street) are our picks for business users who want color transparencies and general color output. The compact PaintWriter is the least expensive printer in the report and is easy to set up and use. The PaintWriter XL is a beefier version of the PaintWriter — some might call it cumbersome. It prints on B-sized paper and can be hooked up to a LocalTalk network. The PaintWriters come with newly formulated inks that produce better-looking prints than those from last year's models, and they produced the best-looking transparencies.

One printer had little to recommend it, however: the **Sharp JX-730 Color Ink Jet** (\$2,195 list, \$1,695 street), which finished last in the speed and image-quality tests. Sharp manufactures the JX-730's engine and sells it to Tektronix for use in the ColorQuick, but the Tektronix printer is by far the better buy.



The Tektronix ColorQuick (left) is the best inkjet printer for demanding graphics. For business presentations, we recommend the Hewlett-Packard PaintWriter (front) and the PaintWriter XL (right).

Table 1 Criteria

List price — The list price is the manufacturer's suggested retail price.

Street price — The street price is an average price charged by dealers around the U.S. in June 1991.

Resolution (dots per inch) — The number of dots of ink the printer can produce per inch.

Maximum printable area — The dimensions of the maximum image size.

Interface — The type of connection between the printer and the Mac.

Driver — The name or publisher of the driver software that ships with the printer.

No. of dither patterns — The number of dither patterns the driver software can produce.

Outline fonts — The number and type of outline fonts shipped with the printer.

Color matching — Does the printer come with software that attempts to match printed colors to the colors on the host Mac's monitor?

Spooler-software support — Does the driver software support third-party print spooling so that you can print in the background?

Input — A list of media-input options.

Paper sizes — A list of paper sizes supported.

Tray capacity — The number of pages the input tray or feeder can hold.

Options — A list of other media-input options.

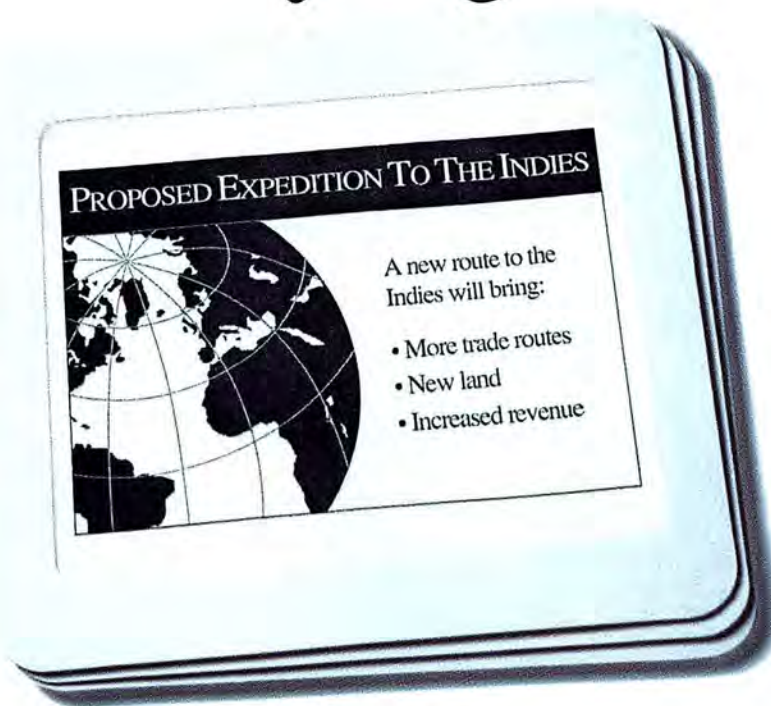
A-sized paper — The capacity for and cost of A-sized paper.

A-sized transparencies — The capacity for and cost of A-sized transparent media in packs that are supplied by the manufacturer.

Ink — The cost of ink cartridges or vials.



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Table 1: Features of Color Inkjet Printers

	Hewlett-Packard PaintWriter \$\$\$	Hewlett-Packard PaintWriter XL \$\$\$	Sharp JX-730 Color Ink Jet \$	Tektronix ColorQuick \$\$\$
List price	\$995	\$2,595	\$2,195*	\$2,345†
Street price	\$750	\$1,800	\$1,695*	\$1,800†
Pros	Inexpensive. Produces bright and saturated transparencies. Quiet. Compact. Color-matching software bundled.	Fast. Produces bright and saturated transparencies. Networkable. Quiet. Color-matching software bundled.	Prints on 14-x-21-inch paper. Comes with 35 outline fonts.	Produces brilliant colors on clay-coated paper. Fast. Powerful color-matching software. Highest resolution.
Cons	Slow. Three colors in one cartridge. Printing on clay-coated paper produces dull colors.	Large footprint. Printing on clay-coated paper produces dull colors.	Slow. Inks run and bleed on transparencies. Wet prints. Cut-sheet feeder and Mac interface cost extra.	Wet prints. Spotty images when printing transparencies. No outline fonts.
Specifications				
Resolution (dots per inch)	180 dpi	180 dpi	180 dpi	216 dpi
Maximum printable area	8 x 10.7 in.	10.7 x 16.6 in.	13.6 x 21 in.	11 x 17 in.
Print-engine manufacturer	Hewlett-Packard	Hewlett-Packard	Sharp	Sharp
Interface	serial	serial, LocalTalk	serial, \$125; NuBus card, \$195	SCSI§
Software				
Driver	Hewlett-Packard	Hewlett-Packard	Cricket Expressions	ColorQuick
No. of dither patterns	3	3	8	1
Outline fonts	4, Agfa	4, Agfa	35, URW	none
Color matching	yes	yes	no	yes
Spooler-software support	yes	yes	no	no
Media handling				
Input	Z-fold, manual	sheets, manual	manual	sheets, rolls, manual
Paper sizes	A, A4	A, A3, A4, B	A, B	A, legal, B, 12 x 18 in.
Tray capacity	NA	200 sheets, 70 transparencies	NA	100 sheets
Options	none	none	cut-sheet feeder, \$480 paper-roll feeder, \$40 tractor feeder, \$290	tractor feeder, \$300
Supplies				
A-sized paper	200 sheets, \$21	200 sheets, \$21	500 sheets, \$39	500 sheets, \$42
A-sized transparencies	50 sheets, \$65	50 sheets, \$65	third party	50 sheets, \$49
Ink	3-color, \$35; black, \$30	\$30 per color	2 vials, \$12	2 vials, \$12
Other				
Dimensions (W x D x H, in.)	17.5 x 12 x 4	29.5 x 17.5 x 9	25.75 x 14 x 4.75	24.5 x 14.75 x 6
Weight	11 lb	39 lb	28.75 lb	26 lb
Warranty	1 year	1 year	90 days	90 days
Company				
	Hewlett-Packard Co. 19310 Pruneridge Ave. Cupertino, CA 95014 (800) 752-0900 (201) 529-9500	Hewlett-Packard Co. 19310 Pruneridge Ave. Cupertino, CA 95014 (800) 752-0900 (201) 529-9500	Sharp Electronics Corp. Sharp Plaza, Systems Division Mahwah, NJ 07430 (800) 237-4277	Tektronix, Inc. Graphics Printing Division Wilsonville, OR 97070 (800) 835-6100

*You must buy either a Paralink cable (\$125), from Jonathan Freeman Technologies, or a Hurdler II-CPI NuBus card (\$195), from Creative Solutions, for the Mac interface.

†You must also buy the Mac Accessory Kit (\$150), which includes manuals, software, 100 sheets of clay-coated paper, two vials of each of the four color inks, and a power cord.

§You must purchase a third-party SCSI cable.

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2-1/2 MB	Remove only two 256K SIMMS, install two 1 MB SIMMS.
4 MB	Replace all four 256K SIMMS with four 1 MB SIMMS.
To upgrade an 8-socket Mac II, IIfx, IIfx, or SE 30 to this amount of memory.	Do this: (Install in multiples of four only.)
4 MB	Remove all four existing 256K SIMMS, install four 1 MB SIMMS, leave remaining sockets for future expansion.
5 MB	Keep existing 256K SIMMS, install four 1 MB in remaining sockets.
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TelePort, the ADB Modem (Global Village Communication)
The perfect choice for powerful yet compact Mac communication. This 2400 baud modem with MNP5 data compression packs Hayes compatibility and error-free communication. TelePort plugs into your mouse (ADB) port and provides a pass-through connector for other devices. It uses no external power supply, and leaves your serial port free for other uses! **MOD0049 \$139.**

Also, TelePortFAX includes SendFAX 9600 baud modem software. Hold OPTION as you drag FILE-PRINT to easily send faxes worldwide. **MOD0058 \$185.**

Random House Encyclopedia (Microlytics)
Delivers a wealth of information to you through your Mac. Need a quick overview of the history of Peru? What are the principal agricultural products of Romania? How does a nuclear power plant work. Whenever you need to look up factual information, you can find it fast. **EDU0217 \$68.**

The Elements of Style
The classic handbook on writing comes to the Mac. It covers five major categories (Rules of Usage, Elementary Principles of Composition, A Few Matters of Form, Words and Expressions Commonly Misused, and An Approach to Style). **EDU0242 \$35.**



System 7 Compatibility: ⑦ indicates that the product will run under System 7.

ACCESSORIES

Toner Cartridge	
LaserWriter II	105
Basic Needs, Inc.	
ACC0355 Dust Cover - Mac II & Extended Keyboard (grey nylon)	17
ACC0343 HardTops ImageWriter II Cover	17
ACC0347 HardTops Mac Extended Keyboard Cover 15	17
ACC0345 HardTops Mac Standard Keyboard Cover 15	17
ACC0465 MacTux/ci Monitor Stand	49
ACC0351 Utility Pac	15
B.A.S.F. (BASF)	
MED0030 Disks - DS/HD 1.44 Meg (box of 10)	22
MED0029 Disks - DS/DD (box of 10)	12
Curtis	
ACC0469 Command Center	69
Ergotron	
ACC0344 MacTill II - 13" Color RGB	75
ACC0128 MacTill Plus/512 - Platinum	68
ACC0009 MacTill SE, SE/030 - Platinum	68
Famous Engineering Brand	
DAC0038 DigiMatic	179
I/O Design, Inc.	
ACC0028 MacLuggage™ Plus Carrying Case	64
ACC1070 MacLuggage™ SE Carrying Case	75
ACC0327 Monitorware Apple RGB Case	79
ACC0427 Ultimate Classic/SE Ext. Carrying Case - Black	85
ACC0440 Ultimate Classic/SE Ext. Carrying Case - Navy	85
ACC0529 Ultimate Classic Carrying Case - Black	68
ACC0528 Ultimate Classic Carrying Case - Navy	68
Kensington	
ACC0094 Anti-Glare Filter-Beige	33
ACC0621 Classic Anti-Glare Filter	49



MacPro Plus (Key Tronic)

Key Tronic's new MacPro Plus keyboard is compatible with all Macintosh computers. The enhanced 105-key layout includes Period/Comma lock capability, an interchangeable Caps Lock and Ctrl keys. Also, the connecting cable you need is offered at no extra charge. The keyboard is backed by a limited lifetime warranty and unlimited toll-free product support. Includes offer for Tempo II, a keyboard macro package from Affinity Microsystems a \$149.95 value FREE! **INP0156 \$145.**

ACC0591 Premier Classic Mac Plus/SE Carrying Case 69
ACC0482 Premier Leather Case 185

ACCOUNTING & PERSONAL FINANCE

Checkfree Corporation	
⑦FIN0088 CheckFree	19
Computer Associates	
FIN0044 ACC PAC Bedford Simply Accounting 1.1	139
Inman	
FIN0116 Business Plan Toolkit	99
FIN0013 Business Sense 1.4	129
Intuit	
FIN0130 Quicken 3.0	47
Meca	
⑦FIN0039 Andrew Tobias' Managing Your Money 4.0	99

Nolo Press	
BUS0133 For The Record 2.0	32
BUS0132 WillMaker 4.0	35
Peachtree	
⑦FIN0059 AI Once! 1.2	189
Reality Technologies	
⑦FIN0068 WealthBuilder (Mac)	99
Softsync/BLOC Publishing	
⑦FIN0048 Accountant Inc.	339
Teleware, Inc.	
⑦FIN0087 M.Y.O.B. 2.0	139
TimeSlips Corp.	
⑦FIN0129 TAL	55

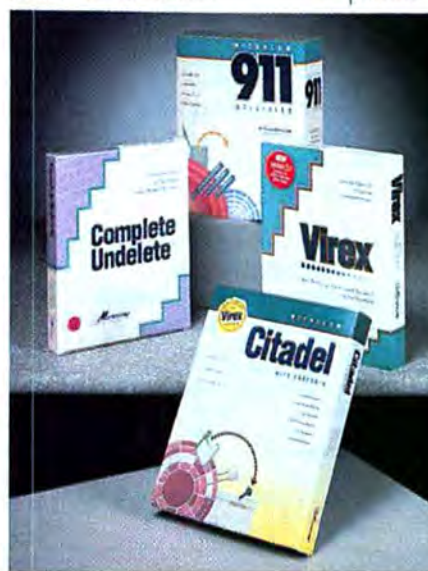
BUSINESS & PRESENTATION

A Lasting Impression	
BUS0086 ResumExpert Cover Letters	49
BUS0102 Manager Edition	49
BUS0103 Sales/Marketing	49
⑦BUS0087 ResumExpert (Word 3.0/4.0 version)	49
BUS0107 Computer Science/Engineering	49
Abacus Concepts	
⑦STA0006 MacSpin 3.0	185
⑦STA0008 StatView II 1.03	309
⑦STA0010 StatView SE+Graphics 1.03	199
⑦STA0022 SuperANOVA (MacII Family)	309
Acus	
DAT0045 4th Dimension 2.1	489
AEC Management Systems	
BUS0129 FastTrack Schedule 1.5	139
DAT0055 AEC Information Manager	409
After Hours	
⑦DAT0076 TouchBASE	89
Aldus	
BUS0066 Persuasion 2.0	329
ASD Software, Inc.	
BUS0134 Planisort	195
BUS0146 Planisort - 5 pack	579
BUS0147 Planisort - 10 pack	839
Ashton-Tate	
DAT0042 dBase Mac	SPECIAL! 59
⑦BUS0054 Full Impact 1.1	SPECIAL! 49

Utilities Family (Microcom)

The Virex application program detects and repairs files infected by Macintosh viruses. The Virex 3 INIT repairs damaged files instantly before a virus can spread. **911 Utilities**, a collection of disk and file recovery tools, protects computer-based information from loss or damage so you'll never have to worry when your Mac goes down. **Complete Undelete** maintains a "Delete Log" of files thrown in the trash and recovers them if they were accidentally thrown away. **Citadel** with Shredder, a security tool box, protects your computer from unauthorized access.

Virex 3.0 UT10093 \$59.
911 UT10191 \$89.
Complete Undelete UT10140 \$49.
Citadel UT10233 \$93.



The "ULTIMATE" SE Carrying Case (I/O Design, Inc.)

The "ULTIMATE" SE Carrying Case is designed with the same high quality standards as other MacLuggage products. This case offers internal, padded compartments for ANY Macintosh keyboard, mouse, external hard disk and cables, also holds the new Macintosh Classic. It features two additional exterior pockets for everything from disks to umbrellas. Combine these features with sturdy Dupont Cordura nylon and 1/2 inch high density foam padding and you'll see why this is the "Ultimate" carrying case for your Mac. Available in black and navy blue. **Black: ACC0427 \$85.** **Navy: ACC0440 \$85.**



FREE!

The Power User's Tool Kit has quickly become a legend among Macintosh users worldwide. Now, here's the sixth edition — stuffed with 11 powerful programs that you'll wonder how you ever did without. And it's **FREE*** from MacWAREHOUSE! BiPlane is a simple but powerful spreadsheet with graphics. MenuKey 1.1 gives you the Command key equivalents for menu commands in your favorite applications at a glance. The Styler 2.0 gives you a quick way to print font style sheets for any or all of your fonts, and Area Codes/Time Zones is a handy DA that will help you keep in touch with the country! And there's much, much more! The programs are shareware, so you can try them free of charge. If you wish to continue using them, some authors ask that you pay a small fee (\$10-\$59). All the details are explained on the disk, which is yours to keep. The Power User's Tool Kit 6.0 is **FREE*** when you order from MacWAREHOUSE. *You pay only \$1.50 postage/handling charge. Ask for Item #AAA 0012.



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hundreds of the latest Mac products in the comfort of your own home — and save big \$\$\$ when you buy! (See complete details with your coupon book.)

AEHD 3.5" Drive (1.44)
(Applied Engineering) Add a second 1.44Mb drive to any SuperDrive-equipped Macintosh and avoid "disk swapper's elbow." Same performance, same color, same features as Apple's FDHD SuperDrive but at a much better price. The 3.5" external high-density drive incorporates the same high quality Sony mechanism Apple uses and features auto-eject, MS-DOS compatibility, exclusive two-color read/write indicator light and a full one-year warranty. **DRI0287 \$245.**



GraceLAN 2.0
(Technology Works) Analyzes every connected device on your network. It scans every Mac, printer, PC, monitor, NuBus card, network peripheral and SCSI device, then it reports back to you on systems and memory configurations, software versions, desk accessories, INITs, and printer drivers. Also sorts by any field name, such as user or machine type. You can spot the user with the incorrect LaserWriter Prep in seconds. All information is gathered on demand and is always accurate and up to date and can be printed or exported for word processing or spreadsheet work. **NET0133 \$319.**



DeskPaint & DeskDraw 3.03
(Zedcor) With DeskPaint & DeskDraw 3.03, you can create and edit graphics within any application. These DAs now edit black and white, gray scale and 32-bit color images, in multiple windows. They offer graduated fills, brightness and contrast controls, and an intelligent lasso and paint bucket. New DeskDraw has rulers, arrows, and multiple fonts, sizes and styles. **GRA0199 \$113.**



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Avery Dennison	
ACC0489 MacLabelPro	49
ACC0589 1st Impression The Desktop Bindery	299
ACC0590 1st Impression First Pack	79
Baseline Publishing	
BUS0149 1 Shot Worksheet	55
Casady & Greene, Inc.	
DAC0010 QuickDix	35
CE Software	
BUS0135 Alarming Events	85
GRA0070 CalendarMaker 3.0	31
Clarix	
DAT0064 FileMaker Pro	215
BUS0058 MacProject II 2.5	359
BUS0065 SmartForm Designer	289
DeltaPoint, Inc.	
BUS0099 DeltaGraph 1.5	129
Fisher Idea Systems	
BUS0168 IdeaFisher	389
BUS0169 Strategic Planning Module	65
Fox Software	
DAT0047 FoxBase+Mac 2.0	295
Informix	
BUS0064 Wingr 1.1	245
Kaetron	
BUS0100 TopDown 3.0	219
Microsoft	
BUS0167 Excel 3.0	309
BUS0008 PowerPoint 2.01	245
BUS0088 The Microsoft Office	Cal
BUS0014 Works 2.0	189
On Technology	
BUS0165 Meeting Maker 5-User	299



Connectix MODE32 (Connectix) MODE32 software allows any Mac II, Ix, IIfx or SE/30 to use standard System 7.0 32-bit addressing. Now these models can use up to 128 MB of RAM, and 1024 MB of Virtual Memory like the current machines. Make your dirty ROMs 32-bit clean, get MODE32. **UTI0222 \$99.**

MC73 PMMU The MC73 PMMU chip lets your original Mac II use System 7's standard Virtual Memory. Mac IIs lack the PMMU built into other machines, but have the socket for one. Includes detailed instructions and grounding strap. **DRI0385 \$159.**

BUS0174 FastLabel 3.0	45
Zedcor	
BUS0118 DESK 3.03	209

CD-ROM

EDUCORP	
CDR0010 Int. Graphics Library	229
EDU0198 Lingua-ROM	399
Microsoft	
BUS0119 The Microsoft Office CD-ROM	Call
Quantum Leap	
CDR0024 GigROM Archival Library	109
CDR0025 MacAdemic Educational Library	79
CDR0026 CD7 SuperLibrary	49
Wayzata Technology	
EDU0194 The World Fact Book	79

COMMUNICATIONS & NETWORKING

Caravelle Networks Corporation	
NET0099 Mac to Mac - 5 pack	165
NET0100 Mac to Mac - 10 pack	229
CE Software	
COM0054 In/Out (5 user Pak)	128
COM0041 QuickMail 2.2 (1 - 10 users)	315
CompuServe	
COM0085 Membership Kit For the Macintosh	22
COM0040 Navigator 3.0	49
DataViz	
COM0001 MacLink Plus / PC 5.0	129
COM0052 MacLink Plus / Translators 5.0	109
Dayna Communications, Inc.	
UTI0116 DOS Mounter 2.0	55



NET0125 DaynaPort E/Z	285
Farallon™ Computing	
COM0078 Liaison 3.0	279
NET0005 PhoneNET® 128/512	35
NET0084 PhoneNET® Manager's Pack	669
NET0007 PhoneNET® Plus SE & II	33
NET0040 PhoneNET® Plus, SE & II - 10 Pack	198
NET0019 PhoneNET StarController®	899
NET0059 StarController™EN (EtherNet)	1359
NET0058 Timbuktu® 2.0 - Remote Access Pack	925
NET0122 Timbuktu® 4.0	136
NET0034 Timbuktu Remote® 2.0	135
PhoneNET® Card for EtherNet	
NET0089 Nubus Mac II	299
NET0091 SE/30	299
NET0090 Nubus 10-pack	2499
FreeSoft	
COM0060 White Knight V 1.1	85
Hayes	
COM0015 Smartcom II 3.2	84
Insigna	
UTI0174 AccessPC	65
COM0063 Soft PC AT/EGA Module	125
COM0045 SoftPC 1.3	245
COM0091 SoftPC 2.0 for Mac Classic & LC	139
International Business Software	
NET0129 DataClub Single	119
NET0097 DataClub - 3 Pack	269
NET0098 DataClub - 10 Pack	539
Microcom	
NET0131 Carbon Copy Mac 2.0 Single	59
NET0132 Carbon Copy Mac Unlimited	189
Prodigy	
COM0056 Prodigy Starter Kit for the Mac	27



PowerKey with Quickkeys Lite-Remote

Turns your Macintosh and peripherals from the keyboard. Can be programmed with an on/off schedule, and four outlets provide power line protection. Remote option lets you turn on your system with a single phone call. Works with all ADB-equipped Macs. **PowerKey ACC0535 \$64. PowerKey Remote ACC0619 \$35.**



M.Y.O.B. 2.0

Streamlines your accounting, and delivers essential information on the status of your business. Create a sales invoice and MYOB adds the amount to Receivables, decrements the inventory, and generates the monthly customer statement. Integrating G/L, A/R, A/P, Inventory and card files. **FIN0087 \$139.**



DaynaPORT

DaynaPORT Ethernet adapters allow users to connect all models of Macintosh computers to any type of Ethernet cabling, including 10BASE-T. New DaynaPORT E/Z offers the easiest Ethernet connection for the Plus, Classic, SE and Portable. **NET0125 \$285.**



Publish It! Easy with FILE IT! 2.1

All-in-one desktop publisher includes: easy page layout, drawing and painting tools, rotate text in one-degree increments, slide-show feature, Quick-Start Mini-Manual. File It!, advanced built-in database and mail merge program lets you edit, search and sort files or customized form letters without leaving Publish It! Easy. Eddy Award Winner. **DTP0048 \$139.**



Disk Doubler 3.7 (Salient Software)

Disk Doubler 3.7, the system 7 savvy version, compresses your files when you save them and expands them when you open them. It doubles your hard disk and floppy disk storage capacity. Works transparently within any application, and operates in the background under MultiFinder. Disk Doubler works with documents, applications, plus sound graphics, and scanner files. **UTI0179 \$49.**

BUS0166 Meeting Maker 10-User	559
Portfolio Systems	
BUS0101 Dynadex - The Instant Address Book	72
DTP0055 DynoPage	72
Power Up	
BUS0073 Calendar Creator	35
BUS0121 FastForms 2.0	119
Round Lake Publishing	
BOK0026 Legal LetterWorks	59
BOK0007 LetterWorks	59
BOK0016 Sales LetterWorks	59
Satori	
BUS0025 Bulk Mailer 3.2 5	75
Shana Corp.	
BUS0125 Informed Designer	159
BUS0162 Informed Manager	99
Softview (Full line available)	
BUS0138 FAX Forms Designer	169
FX Expense Reports	68 49
Symantec Corporation	
BUS0176 GreatWorks	209
BUS0055 More 3.0	265
Synex	
BUS0120 MacEnvelope Plus 2.0	185
BUS0145 MacPhoneBook 3.0	32
Timeslips	
BUS0043 Timeslips III 2.0	195
T/Maker	
BUS0152 SmartBundle	215
Vertical Solutions	
BUS0113 FastEnvelope	45

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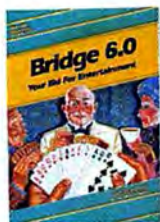
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ClickArt Events & Holiday Cartoons
Add fun and humor to your upcoming holiday invitations, announcements and publications! ClickArt Events and Holiday Cartoons is a collection of 100 imaginative images by award winning cartoonist, Phil Frank. The portfolio works with virtually all page layout, word processing and paint applications and can be colorized with SuperPaint. **GRA0270 \$32.**



DayStar's RAM PowerCard
Expand to 256 MB of true RAM per card. Chain multiple cards together for even larger amounts of RAM. Create a large RAM disk which allows disk intensive work such as photo retouching, database sorts, or 3-D renderings to fly! System 7's virtual swap file can be stored in RAM, providing real-time virtual memory. **DR10416 \$779.**



Bridge 6.0
Play a rubber of Bridge 6.0 with the Mac's three players. Bid with either the Stayman or Blackwood conventions. Bridge 6.0 handles all the book-keeping and tactfully informs you of any mistakes in bidding or play. It saves hands for later replaying and analysis. **ENT0303 \$29.**



QuickSCSI
Boost the SCSI performance of your Mac and maintain real-time mirror image backups. Allows your hard drive to work at its maximum speed as high as 4.4 Mbytes per second. Other features include, Disk Mirroring, Disk Cloning, and multiple SCSI ports. **DR10406 \$479.**

Sitka		
NET0056	InBox Plus 3.0	1299.
NET0057	DOSTOPS 3.0	165.
NET0049	MACTOPS 3.0	187.
Software Ventures		
COM0094	Microphone II 4.0	215.
Synergy		
COM0003	Versa Term Pro 3.5	174.
Technology Works		
NET0113	GraceLAN 2.0	319.

DESKTOP PUBLISHING

Aldus		
DTP0045	PageMaker 4.01	499.
DTP0047	PrePrint	329.
Letraset		
FON0086	LetraStudio	275.
Postcraft		
DTP0063	Layouts	85.
Quark, Inc.		
DTP0028	QuarkStyle	199.
DTP0049	XPress 3.0	519.
Silicon Beach		
DTP0040	Personal Press	199.
TimeWorks		
DTP0048	Publish It! Easy with File IT! 2.1	139.

DISK DRIVES & BOARDS

Applied Engineering		
DR10287	AE HD Mac Drive	245.
INP1148	QuadraLink	209.
Computer Care		
DR10337	MacRescue Video	349.
DR10338	Video MacPac	349.
Computer Friends		
GRA0251	ColorSnap 32 Plus	649.
Dayna Communications, Inc.		
DR10174	DaynaFile dual 360K (5.25) & 1.44 (3.5) 739.	
IDS		
DR10408	Pro 40 40 Meg Drive	349.



V-Series Ultra Smart Modem (Hayes) Bundled with Hayes award winning Smartcom II software. RS232 cables and HayesConnect network server software. Offers the best combination of connectivity and data throughput available in a high speed modem such as 100% error control using both the V.42 standard and MNP protocols and the option of wither 4 to 1 data compression with v.42bis or 2 to 1 with MNPS error control. HayesConnect allows users to share modems or other serial devices such as plotters or printers across and AppleTalk network. **MOD0065 \$829.**

PowerUser™		
DR10201	20 Meg External Hard Drive	329.
DR10206	44 Meg Removable	589.
DR10203	40 Meg External Hard Drive	349.
DR10204	60 Meg External Hard Drive	419.
DR10205	80 Meg External Hard Drive	459.
DR10326	105 Meg External Hard Drive	499.

EDUCATIONAL & INSTRUCTIONAL

Beacon Technology, Inc.		
HYP0034	HyperBible International Version 2.0	125.
HYP0035	HyperBible King James Version 2.0	125.
Broderbund		
GRA0268	Kid Pix	29.
EDU0170	The Playroom	29.

Accountant Inc. (Softsync/BLOC) Accountant Inc. is the most complete integrated accounting and financial management package for the Mac says MacUser Magazine 3/91. Starting up with Accountant Inc. is quick and easy. Combines exceptional power with an elegant user interface to provide more flexibility and better reporting with less work. Unlike other packages, Accountant Inc. will grow as your business grows. Package includes Invoicing, Inventory, Receivables, Payables, Check Writing, Job Cost, Payroll, Integrated General Ledger and Financial Reporting. **FIN0048 \$339.**

DR10409	Pro 80 80 Meg Drive	459.
DR10410	Clipper 20 20 Meg Drive	379.
DR10411	Clipper 40 40 Meg Drive	559.
Kenneth Technology		
DR10218	Drive 1200	259.
DR10141	Drive 2.4	329.
DR10219	Drive 360 (5.25 in. floppy disk drive)	259.
DR10140	Report	195.

Mass Microsystems		
DR10256	DataPak MO 512 MB	3425.
	Read-write/optical	595.
GRA0243	QuickImage 24 Video Frame Grabber	725.
DR10253	DataPak	779.
DR10254	DataPak II	1499.
DR10323	DataPak Duo	1279.
DR10354	DataPak 88	

Micron Technology		
DR10187	Xceed 8-bit Video Card NB6-48	349.
DR10236	Xceed Ilici - 128 Cache Card	239.
MicroTech International, Inc.		
DR10294	Athena A100 100 Meg Drive	899.
DR10293	Athena A50 50 Meg Drive	599.
DR10311	Europa 100 Meg Drive	599.
DR10308	Europa 20 Meg Drive	349.
DR10309	Europa 40 Meg Drive	399.
DR10307	MicroTech R50 50 Meg Removable	999.
DR10376	Nova N50 Meg Drive	565.

Optical Access International		
DR10251	Access CD	649.
DR10252	Access MF	2995.
MED0036	Access MF	
	Rewritable Optical Cartridge	250.

Peripheral Land, Inc.		
DR10375	Infinity 88 Removable Single	1359.
DR10193	Infinity Dual 40Mb Removable	1259.
DR10115	Infinity Turbo 40 Meg Removable	739.
DR10154	Turbo Floppy 1.4 Drive	309.
DR10406	QuickSCSI	479.



Queue		
EDU0109	Computer SAT Prep	57.
Visionary Software		
EDU0207	LifeGuard	49.
EDU0209	Synchronicity 3.0	49.

Voice & Video		
	Getting Started Video: Excel 2.2, PageMaker 4.0, Word 4.0	ea. 55.
	Advanced Techniques Video: Excel 2.2, PageMaker 4.0, Word 4.0	ea. 55.
EDU0063	HyperCard Getting Started Video	55.

Zondervan Publishing House		
BOK0021	MacBible - King James Version	79.
BOK0020	MacBible - New International Version	79.

ENTERTAINMENT

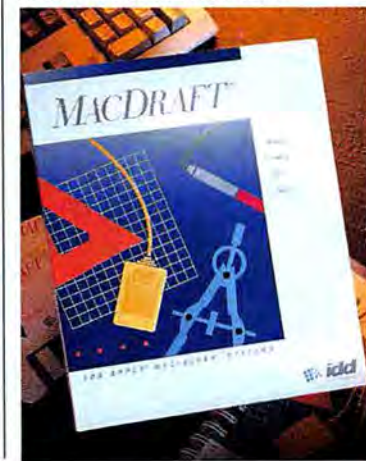
Artworx		
ENT0303	Bridge 6.0	29.
Broderbund		
ENT0259	Shufflepuck Cafe	25.
	Where is Carmen Sandiego?	ea. 29.

Bulls City Software		
ENT0308	Morality's Revenge	35.
Bullseye		
ENT0046	Fokker Triplane Flight Simulator 2.8	25.
ENT0261	P51 Mustang 2.8	35.

Centron Software, Inc.		
ENT0264	BlackJack Ace	27.
ENT0329	BlackJack Strategy Tester w/BlackJack Ace65.	27.
ENT0384	Canis	27.
ENT0277	Casino Master	40.
ENT0289	Casino Master Deluxe Mac II Version	45.
ENT0257	CrapsMaster	27.
ENT0383	Puzzle Master	29.

Electronic Arts		
ENT0321	Earl Weaver Baseball	32.

MacDraft 2.1 (Innovative Data) Provides the tools you need to create accurate drawings on your Mac. It supports PostScript output, has a removable geometric drawing tool palette, multiple layers (limited only by available memory), on-line symbol libraries, 44 different scales, custom line styles, dimension lines, Bezier and spline curves, automatic area calculation, and smoothing of freehand shapes. MacDraft supports 32-bit QuickDraw and custom fill patterns in both black and white and color. Reads TIFF and MacDraw II files. **CAD0039 \$279.**



Davidson & Associates		
EDU0118	Math Blaster Mystery	29.
HyperGlot		
EDU0179	French Tense Tutor	39.
EDU0183	French Word Torture	35.
EDU0189	Learn To Speak French	69.
Individual Software		
EDU0057	Typing Instructor Encore	19.
EDU0203	Training for PageMaker 4.0	39.
EDU0193	Training for Microsoft Word	42.
Learning Company		
EDU0084	Math Rabbit	35.
EDU0048	Reader Rabbit 2.2	35.
MECC Marketing		
ENT0381	The Oregon Trail	29.
EDU0190	Number Munchers	29.
EDU0191	Word Munchers	29.

Microlytics		
EDU0217	Random House Encyclopedia	68.
EDU0242	Elements of Style	35.
MicroMaps		
GRA0229	MapArt PICT Format	95.
GRA0228	MapArt EPS Format	95.
Nordic Software		
EDU0142	MacKids Preschool Pack	36.
EDU0276	Word Search Deluxe	35.
Penton Overseas (Full line available)		
	VocuaLearn Level I or II: French, German, Hebrew, Italian, Japanese, Russian or Spanish	ea. 35.

Personal Training Systems		
	Macintosh, HyperCard, FileMaker Pro, Microsoft Excel, Microsoft Word, Aldus PageMaker 4.0, Aldus FreeHand, Aldus Persuasion, Quark XPress 3.0	ea. 52.
EDU0277	Converting to System 7-part 1	52.
EDU0278	Converting to System 7-part 2	52.

GUARANTEE

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MacUser Rating 4/91

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(ASD) "It's Sleek, Fast, and safe. I highly recommend it." MacUser April 1991. Protect your Hard Drives and Partitions from unauthorized access (including security bypass with a system diskette), copying and erasure. Applications and File/Folders (including system folder) from unauthorized access, deletion, and/or illegal copying. Desktop (including system folder) from alterations by unauthorized user. Keep an eye on System Usage with the system users log which continuously tracks user/group activity. System 7 compatible.

Single: UT10135 \$139.

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ENT0355 Harpoon	39
ENT0382 PGA Tour	39
Sir Tech Software, Inc.	
ENT0346 Bane of the Cosmic Forge	35
ENT0347 Wizardry II: Knight of Diamonds	29
Spectrum HoloByte	
FACES: TETRIS, Welltris	ea 25
The Software Toolworks	
ENT0281 Chessmaster 2100	32
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ENT0323 Sands of Fire	32
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ENT0274 MacGolf Classic	52

Fonts & Applications

Adobe Systems, Inc.	
ENT0264 Adobe Type Manager 2.0	59
ENT0351 Adobe Type On Call	NEW! 47
Adobe Type Set 1 or 2	ea 65
ENT0326 Adobe Type Set 3	129
Smart Art I, II, III or IV	ea 65
DAC0028 Adobe TypeAlign	65
ENT0295 Adobe Type Reunion	45
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Altsys	
UT10224 EPS Exchange	89

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Ares	
FontMonger	65
Broderbund	
TypeStyler	119
Dubl-Click	
MenuFonts 3.0	45
Pacific Data Products	
INP0153 Pacific MacPage	529
Postcraft	
Effects Specialist	115
QMS	
UltraScript	135
Sonnet	
FontCard NTX	469
TeleTypesetting	
T-Script 3.0	92
T-Script Basic	55

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3G Graphics	
Images with Impact! Accents & Borders 1	65
Images with Impact! Business 1	65
Images with Impact! People 1	95
Abracadabra	
Design Your Own Home-Architecture	65
Design Your Own Home-Interiors	65
Adobe Systems, Inc.	
Illustrator 3.0 (w/ ATM 2.0)	379

Creative Software	
Easy Color Paint 2.0	47
Deneba Software	
Canvas 2.1	189
UltraPaint	125
Dream Maker	
Captures Vol 1 Business Images	69
Captures Vol 2 Business Images	69
Captures Vol 3 Sports	69
MacGallery (Hypercard version)	27
MacGallery (MacPaint version)	27
Electronic Arts	
Studio/8 2.0	189
Studio/32	449
Farallon™ Computing	
MediaTracks™ 2.0	219
MediaTracks™ Multimedia Pack	369
Graphsoft	
Blueprint 2.1	219
MiniCAD+ 3.0	595
Innovative Data Design	
MacDraft 2.1	279
Dreams 1.1	419
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MacroMind Director 3.0	739
Metro Image Base (Full line available)	
Newsletter Maker	85

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(Adobe) Create higher quality, more effective documents and presentations with new Adobe Type Sets for Business. Selected for specific needs and bundled with Adobe Type Manager software the 4 new packages contain typefaces especially chosen for business letters, memos and faxes, overheads and slides, spreadsheets and graphs, and invitations and awards. Each package also contains a 32 page guide including suggestions for effective usage. \$99 ea.

Streamline 2.0	122
PhotoShop 2.0	559
Aldus	
Freehand 3.0	399
Baseline Publishing	
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Master Color	99
Master Paint	73
Bright Star Tech, Inc.	
interFACE	249
Claris	
Clariscad 2.0	645
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The UnMouse

(Microtouch) The UnMouse does everything a mouse can—only faster, easier, and in less space. To move the cursor, simply slide your finger over the glass surface. To make a selection merely press down. The UnMouse also serves as an extended keyboard. Tap the large red button and you have a Power Keypad with 16 keys instantly available to execute macros (60 in advanced mode). With its one million touch points the UnMouse also performs as a small graphics tablet. INP0084 \$169.



Microphone II 4.0

Ideal for International telecommunications. Praised for its ease of use and advanced scripting language, Microphone II 4.0 now contains faster script execution, screen speed, file transfers and new interface design tools. Supports ZMODEM transfer protocol and can operate modems at any speed from 50 to 57,600 baud. COM0094 \$215.



ProModem 24/96MSR

Now with V.42bis/MNP-5 data compression/error correction at no extra cost, for up to 9600 bps throughput. With 9600 bps send/receive fax capability, Macfax 3.0 fax software, MacKNOWLEDGE communications software and cable. MOD0046 \$299.



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Place resizable graphics and text fields anywhere on the page, with full macro capabilities. Its HyperScript programming language makes custom applications easy to create and use. Its incredible 2D and 3D graphics (in color on the Mac II), will amaze and delight you. Wingz provides over 20 different graph types, and you can rotate, elevate, and change the viewing perspective freely. BUS0064 \$245.



More After Dark (Berkeley Systems)

It's M.A.D.! It's More After Dark—Over 25 incredible new displays for After Dark, the Ultimate Screen Saver. Features contest winners Mowin' Man, Tunnel, GraphStat, and many beautiful new fish! Kittens, Art Museum, and Lunatic Fringe game module help save your screen from phosphor burn-in. (Requires After Dark software). UT10230 \$25.

After Dark 2.0

After Dark 2.0 displays over 35 screen savers including classics Flying Toasters and Fish! Includes sound, password protection, logo and message display. UT10119 \$29.

Buy both and save! UT10231 \$45.



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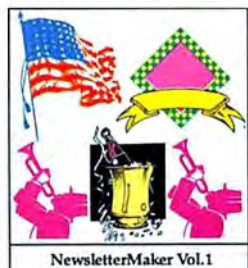
Thunder 7 (Baseline Publishing) Checks the spelling in any document. This handy Desk Accessory is always available, and always uses the same dictionary. Works interactively to warn you of misspellings as you type. **SFL0029 \$56.**

Exposure Pro Takes a snapshot of whatever is on your screen in 8-24 or 32-bit color. Just hit the user-definable key combination, and it captures the screen image. Saves through the Clipboard or Scrapbook, or in Paint, PICT, PICT2, Startup Screen, or Resource formats. **UTI0182 \$78.**

ScreenShot Easily capture your screen images. Hit the user-definable key combination and this handy CDEV pops up a menu to specify whether you want to print or save it in one of several formats. Captures whole screens, windows, menus, or selected portions. **UTI0183 \$34.**



White Knight V.11
The perfect low-cost solution to almost any Mac User's telecommunication needs. Offers the kind of power associated with products costing hundreds of dollars more. Winner of 11 awards including MacWorld's World Class Software Award. **COM0060 \$85.**



Metro ImageBase Electronic Clip Art
Communicate more effectively with fabulous art and graphics from the world's largest publisher of clip art. Each of the 18 ImageBase packages contains at least 100 topic-related images drawn by professional artists. **GRA0169 \$85.**

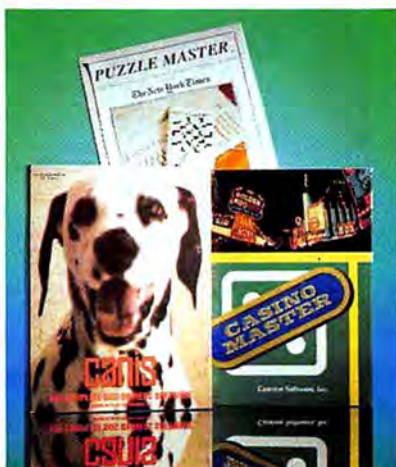


Word Search Deluxe
Perfect for newsletters, classrooms, and puzzle enthusiasts everywhere. Fun to create. Fun to play. Improve your vocabulary in any subject. Use as stand alone application to create, play and print word search puzzles or use in combination with word processing, paint and page layout programs for more decorative results. Supports color and digitized sounds. **EDU0276 \$35.**

Paracomp	
GRA0235 FilmMaker	435.
GRA0041 ModelShop II	579.
GRA0233 Swivel 3D Professional	435.
GRA0234 SwivelArt	81.
Praxitel	
UTI0211 Read My Lips	75.
Silicon Beach	
GRA0092 Digital Darkroom 2.0	259.
GRA0131 Super 3D 2.5	329.
HYP0027 SuperCard 1.5	199.
GRA0112 SuperPaint 2.0	135.
Solutions, Inc.	
DAC0002 SmartScrap & The Clipper 2.01	56.

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INP0157 Scan 300/Color	1499.
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Datadesk International	
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Strata	
GRA0274 StrataVision 3D 2.0	469.
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GRA0227 Atlas MapMaker 4.5	369.
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GRA0199 DeskPaint & DeskDraw 3.03	113.

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INP0060 Turbo Mouse ADB (SE or II)	109.
Key Tronic	
INP0156 MacPro Plus	145.
Koala	
INP0127 MacVision 3.0	269.
Microspeed	
INP0126 MacTRAC ADB	75.
INP0140 MacTRAC DB9	62.
Microtek	
INP0180 Microtek ScanMaker 6002S	1699.
INP0176 ScanMaker 1850S	2459.
INP0162 TrueLaser Printer	2019.

DeltaGraph 1.5 (DeltaPoint) Creates 25 types of charts and graphs. Use the Data Notebook to import data in a spreadsheet format, and DeltaGraph will create the chart you want. Embellish your graph by importing EPS or PICT files. Or, you can use the drawing tools, which include Bezier curves, fill patterns, and full color controls. Lets you print your graphs on either QuickDraw or PostScript printers, plus plotters and film recorders. It's the perfect solution for creating both business and scientific charts. **BUS0099 \$129.**



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Tempo II Plus macros can dramatically simplify your work. Some examples: "Batch-process" hundreds of files with one command. Perform a dozen find/change operations as one step. Check disk space before starting a download, then wait for completion to log off and shut down. "Read" text, window names, etc., out loud. Play macros from a custom dialog box or a pull-down menu. In short, Tempo II Plus can perform practically any task you give it, instantly, accurately, and automatically. NEW-version 2.1 works with System 7, too! **UTI0198 \$105.**

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INP0132 Little Mouse ADB	75.
INP0134 Trackball / ADB	69.
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ACC0535 Power Key w/QuickKeys Lite	64.
ACC0519 Power Key Remote	35.

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UTI0222 MODE32	99.
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DRIO185 Virtual 2.0 PMMU	188.
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DRIO224 64K FastCache IIci	279.
DRIO288 40 MHz PowerCache (IIci)	959.
DRIO290 50 MHz PowerCache (IIci)	1699.
DRIO416 RAM PowerCard	779.
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DRIO130 Marathon 030 (MacII)	599.
DRIO198 Marathon 030 - (Mac SE)	399.
DRIO197 Marathon 030 - (MacPlus)	399.
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DRIO315 Mac Classic Upgrade Kit 20-1 399
DRIO317 Mac Classic Upgrade Kit 40-1 499
DRIO318 Mac Classic Upgrade Kit 40-3 575

Newlife

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DRIO333 Enterprise ULC Upgrade Kit 20 MHz 265
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DRIO357 Enterprise LC 33MHz 68030/68882 1135
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DRIO299 Mercury SCSI Module - Plus 209
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MOD0019 InterFax 12/48 259

MOD0034 InterFax 24/96 339

Applied Engineering

MOD0054 DataLink/Mac 209

Best Data

MOD0021 SmartOne 2400/1200 139

Dove

MOD0038 DoveFax Desktop 299

MOD0053 Dove Fax Plus 359

Global Village

MOD0049 TelePort 2400 ADB Modem 139

MOD0058 TelePort/Fax 9600 185

Hayes

COM0023 Smartmodem 2400 349

MOD0017 Smartmodem 9600 (V series) 589

MOD0060 Personal Modem 2400 w/Smartcom 179

Rapport, Drive 2.4, 360 & 1200

(Kennet Technology) Plug Kennet's New 5.25" Drives, Drive 1200 and Drive 360 into Rapport to read, write & initialize 1.2 MB or 360K MS-DOS 7 Apple II 140K ProDOS. Drive 2.4 plugged into Rapport, is a 3.5" Diskette Drive which reads, write & initializes all Mac & IBM formats expands 800K diskettes to 1.2 MB & High Density Diskettes to 2.4 Mb. Rapport alone enables older Macs to read 720K MS-DOS on the internal floppy drive or read & write 720K on an external Apple 800K Drive.

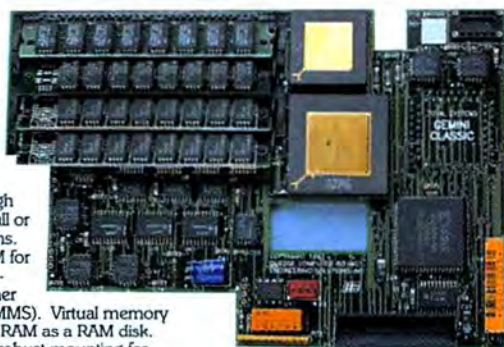
Rapport DRIO140 \$195.
Drive 2.4 DRIO141 \$329.
Drive 360 DRIO219 \$259.
Drive 1200 DRIO218 \$259.

Swivel 3D Professional (Paracomp)

Create new product designs, illustrations, animation, and presentation graphics. Offers 24-bit color, eight light sources, exports MacRenderMan, and full screen display for output to film and video. **GRA0233 \$435.**

Gemini Classic (Total Systems)

Attention Mac Classic users: Gemini Classic™ can transform the way you work! 20-50MHz 68030 CPU has enough power to leave lli users choking in your dust! Races through large documents with full or dual-page display options. 4MB or 16MB total RAM for opening all your heavily-used applications together (supports 1 or 4 MB SIMMS). Virtual memory available, uses Classic's RAM as a RAM disk. Surface-mount circuits, robust mounting for maximum reliability, easily installed. A real Classic-booster at last! See line listings for prices.



Supra Corporation

MOD0020 SupraModem 2400 119.

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Coda Music Software

MUS0044 Finale 2.6.1 549.

Electronic Arts

MUS0004 Deluxe Music Construction 2.5 65.

Farallon™ Computing

MUS0036 MacRecorder® 2.0 174.

Opcode Systems

MUS0083 MIDI Translator 43.

Repertoire

MUS0034 Music Publisher 2.5 359.

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UTIO135 FileGuard 2.7 139.

UTIO130 FileGuard 2.7 - Office Pack 5 499.

UTIO131 FileGuard 2.7 - Office Pack 10 799.

ACC0539 MacAccessCard Reader 299.

Fifth Generation System

UTIO120 DiskLock 118.

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ACC0235 Apple Security Kit 34.

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UTIO028 MacSafe II 107.

UTIO064 NightWatch 1.03 86.

Microcom

UTIO093 Virex 3.0 59.

UTIO150 Virex 10-pack 429.

Symantec Corporation

UTIO214 Symantec Antivirus for Mac 3.0 (SAM) 65.

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Abbott Systems, Inc.

UTIO236 Calc+ 39.

UTIO113 CanOpener 62.

Advanced Software

UTIO192 Intouch 39.

Affinity

UTIO198 Tempo II Plus 105.

Aladdin Systems

UTIO145 StuffIt Deluxe 2.0 62.

ALSoft

UTIO132 DiskExpress II 2.07 55.

UTIO110 MasterJuggler 1.5 55.

Baseline Publishing

UTIO162 Exposure Pro 78.

UTIO187 INIT Manager 34.

UTIO190 Personality 49.

UTIO183

ScreenShot 34.

Berkeley System Design

UTIO119 After Dark 2.0 29.

StrataVISION 3d 2.0 (Strata)

StrataVISION 3d turns that vision in your mind's eye into a finished 3d rendering. You'll be able to create scenes with props, depth, shadows, textures, and reflections. You can adjust the three different types of lighting (directional, spotlight and point source), move the camera, and rotate objects to set up the perfect rendering of your concept. StrataVISION 3d takes full advantage of 32-bit Color QuickDraw. It prints on PostScript printers, film recorders, and video recorders. **GRA0274 \$469.**



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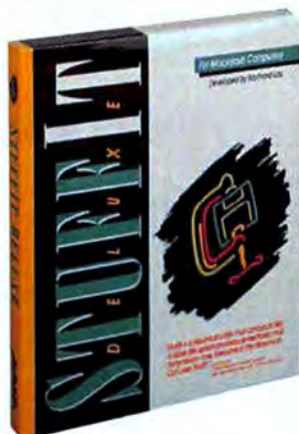
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● UT10230	More After Dark	25
● UT10231	More After Dark/After Dark 2.0 Bundle	45
● UT10074	Stepping Out II 2.02	55
CE Software		
● UT10188	QuickKeys 2 v2	97
Connectix		
UT10148	Hand-Off II 1.1.3	56
Custom Applications		
● UT10136	Freedom of Press 3.0.1	255
● UT10185	Freedom of Press Light 3.0.1	55
Dantz Development		
● UT10118	Retrospect 1.2	148
● UT10196	Retrospect Remote	269
● UT10200	Retrospect Remote 10-Pack	159
Dariana Software		
● UT10218	MacSieth	89



StuffIt Deluxe 2.0 (Aladdin Systems) StuffIt Deluxe is faster, and offers new choices in compression methods. Containing optimizers for text and MacPaint files, StuffIt Deluxe also has the ability to create Self-Unstuffing files that you can send to others. It includes HyperCard XCMDs and DAs for compressing and expanding files from within applications, plus QuickKeys 2 and Microphone II extensions. **UT10145 \$62.**

Dubl-Click		
UT10194	ClickChange	59
Fifth Generation Systems		
● UT10063	FastBack II 2.5	125
● UT10087	SuitCase II 1.2.1	49
Insight Development		
UT10096	MacPrint 1.2	95
Kent Marsh		
● UT10212	FolderBolt	79
Magic Software		
UT10077	Autosave II	26
Mainstay		
● UT10189	MacFlow 3.5	169
Microcom		
● UT10233	Citadel	93
● UT10191	911	89
● UT10140	Complete Undelete	49
Microsoft		
LNG0030	QuickBASIC	64
Now Software		
● UT10167	Now Utilities 2.0	89
● UT10168	Screen Locker	45
ON Technology		
UT10142	ON Location	75
Sallent		
● UT10179	DiskDoublers 3.7	49
SNA		
UT10207	Offline 2.0	65

SuperMac		
UT10203	DiskFit 2.0	65
Symantec Corporation		
UT10151	Norton Utilities for the Mac	89
UT10078	Symantec Utilities for Mac II (SUM)	96
● LNG0051	THINK C 5.0	209
LNG0002	THINK's Pascal 3.0	165
Zedcor		
● LNG0031	ZBasic 5.0	99

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WRD0009	FullWrite Professional 1.1	SPECIAL! 49
Baseline		
● SPL0029	Thunder 7	56
Caere		
	OmniDraft or OmniSpell	ea 69
UT10100	OmniPage 2.1	495
Claris		
● WRD 0026	MacWrite II	139
DeltaPoint		
● WRD0048	TASTE/UltraPaint Bundle	79
Deneba Software		
SPL0015	Spelling Coach Pro. 3.1	124
Microsoft		
● WRD0022	Word 4.0	245
Nova Development		
WRD0044	American Handbook of Business Letters	32
WRD0045	Instant Library of Quotations	32
WRD0043	English Writing Guide	39
Paragon		
● WRD0029	Nisus 3.05	245
Reference Software		
● SPL0023	Grammatix Mac 2.0	59
Sensible Software		
SPL0018	Sensible Grammar	51
SNA, Inc.		
WRD0033	Stylist	51
T/Maker Co.		
● WRD0018	WriteNow 2.2	119
WordPerfect		
● WRD0041	WordPerfect 2.0	279
WordStar		
SPL0028	Correct Grammar 2.0	55

CALC+ (Abbott Systems) ● A next generation calculator, with powerful decimal and Desktop Publishing function. It's fast, easy to use and has all the features of a professional desktop calculator: multiline resizable display, paper tape, fast operation from the Mac's numeric keypad or regular keyboard. It can also perform desktop publishing calculations in inches, centimeters, picas and cieras and do instant conversions between any of these units. **UT10236 \$39.**



STOP PRESS



GreatWorks (Symantec) ● GreatWorks is a new software package for the Macintosh offering the functionality of eight feature-rich applications in a single, integrated program. Offers full word processing, database, spreadsheet, charting, drawing, painting, outlining and communications modules. GreatWorks' eight modules are modeled after popular stand-alone applications so you get power you wouldn't expect to find in an integrated software program. GreatWorks is ready to handle any job, without compromising ease of use. **BUS0176 \$209.**

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If you do PostScript blends, you need the Blender DA. This shareware goody calculates the minimum number of steps necessary to produce a smooth transition between two colors. All you have to do is tell Blender the screen frequency, the output resolution, and the CMYK percentages of the end colors. This simple yet indispensable utility for graphic artists and designers is available from user groups and on-line services such as Zmac.

By Aileen Abernathy

Database publishing: If Timeworks continues to cram innovative features into Publish It! Easy, the Eddy Award winner will be hard-pressed to maintain its standing as an entry-level product. Version 2.1 sounds like a minor upgrade, but it adds two major features: System 7 compatibility and File It!, a built-in database manager that supports mail-merge capabilities. File It!

holds as many as 32,000 records per file and 255 fields per record. Data can be entered from within Publish It! Easy or imported, and database files can be integrated directly into page layouts. All this, and Publish It! Easy still lists for \$250; upgrades are \$50. Timeworks ([800] 323-7744) also has an aggressive new pricing program: Owners of other Mac page-layout programs can buy Publish It! Easy for a mere \$100; user-group members can get a copy for \$125.

System 7 update: Kudos to Adobe, which released a 32-bit-clean version of ATM as we went to press — months ahead of the official release date. Quark has resolved its font differences with Apple, and QuarkXPress 3.1 will support TrueType after all — now it's balloon help that's on the ropes. Quark says that balloon help would add another disk's worth of data to the program and that it can't justify the overhead. Publish-and-subscribe seems safe so far. Most page-layout vendors will ship the System 7-ready versions of their programs before year's end — even Aldus, which has been extremely evasive about System 7 plans for its products. PageMaker 4.x will reportedly support balloon help, TrueType (using the Aldus driver), subscribe, and IAC (including hot links to PageMaker's Table Editor and to FreeHand).

Instant art: If you're bored with 2-D clip art, you might want to use Paracomp's latest SwivelArt packages to jazz up your next publication, presentation, or animation. The five new collections (\$250 each) provide sophisticated 3-D images of maps, human anatomy, vehicles (below), and air and sea subjects. The renditions are smoothly shaded, and you can position, rotate, and color them in Swivel 3D (a limited version of the program is bundled with the clip art). Many objects have hinged or linked parts, so, for example, you can open the doors and trunk on a car image. (415) 956-9525. Wish you had some innovative dingbats? Check out the PostScript picture fonts from U-Design Type Foundry ([203] 278-3648). The latest entry is Bill's DECOrations, a collection of 140 art-deco symbols. Eight previous fonts (all named for designer Bill Tchakirides) include ornaments, ampersands, bullets, and universal symbols. They're priced at only \$29.95 each, and you get a free copy of Bill's Dingbats, the font that started it all. 



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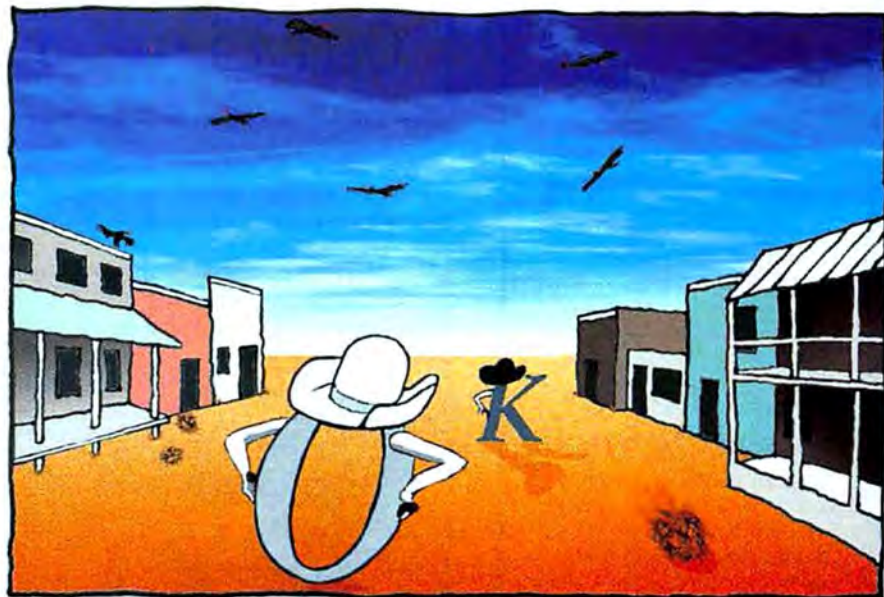
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Dueling Font Standards

TrueType is unequivocally here, but can it unseat the reigning font standard, PostScript Type 1?

By Kathleen Tinkel



In September 1989, Microsoft and Apple shocked the computer industry by announcing a new page-description language and font format — TrueImage and TrueType, respectively — that would compete with the reigning standards, Adobe's PostScript page-description language and Type 1 fonts. Although TrueImage has suffered some setbacks (Microsoft recently reassigned the development team to Windows printing projects), the first TrueType fonts shipped last March and TrueType technology is an integral part of System 7 (it's also an INIT for Systems 6.0.5 and 6.0.7).

Adobe hasn't been sitting on its hands, however. Presented with the first serious challenge to its monopoly, Adobe finally released the long-secret specifications for its PostScript Type 1 format, enabling other font vendors to create Type 1 fonts without paying licensing fees. As a result, Type 1 is now more entrenched than ever as the Mac's font standard, with thousands of typefaces available. Most recently, Adobe announced its Multiple Master technology, an extension to the Type 1 specs in which a single font file can contain several sets of character outlines, enabling you to create a variety of intermediate fonts (see "The Future of Type?", July '91, page 187). All of this has led some industry wags to say, "TrueType is the best thing that ever happened to Adobe."

Because Type 1 is the de facto font standard, you may wonder whether TrueType is something to ignore, avoid at all costs, or welcome

with open arms. If you don't own any Type 1 fonts and most of your work is output on a non-PostScript printer such as the DeskWriter or Apple's new StyleWriter, you'll gain a great deal with TrueType. It'll replace your jagged-looking type with sharp, smooth text at any size, both on-screen and on paper.

TrueType won't seem so special, however, if you've been printing Type 1 fonts on a PostScript printer and using Adobe Type Manager to produce sharp text on-screen. In fact, if you have a sizable investment in Type 1 fonts, use a PostScript illustration program such as FreeHand or Illustrator, or prepare documents for output on high-resolution imagesetters, you may think that TrueType attempts to solve problems you don't have.

Apple says that we don't have to choose, that TrueType and Type 1 fonts can coexist happily on the Mac. Apple also claims that TrueType is a technically better font format than PostScript Type 1 is, that text created with TrueType fonts looks better than that created with analogous Type 1 versions, and that TrueType will make fonts easier to use on the Mac. One thing is certain: TrueType is unequivocally here, and it isn't merely convenient, it's intrusive — when you install System 7, TrueType versions of Times, Helvetica, Symbol, and Courier are automatically placed in your System file. With all this in mind, it's a good time to compare TrueType with Type 1, both in technology and appearance, and see whether TrueType lives up to its press.

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Bit-mapped font Outline font

Figure 1: Bit-mapped fonts suffer from the jaggies when used at noninstalled sizes (top), whereas outline fonts are smooth and sharp at any point size and resolution. The type-design firm Bigelow & Holmes recreated the Mac's standard bit-mapped fonts — Chicago, Geneva, New York, and Monaco (shown here) — in TrueType format for System 7.

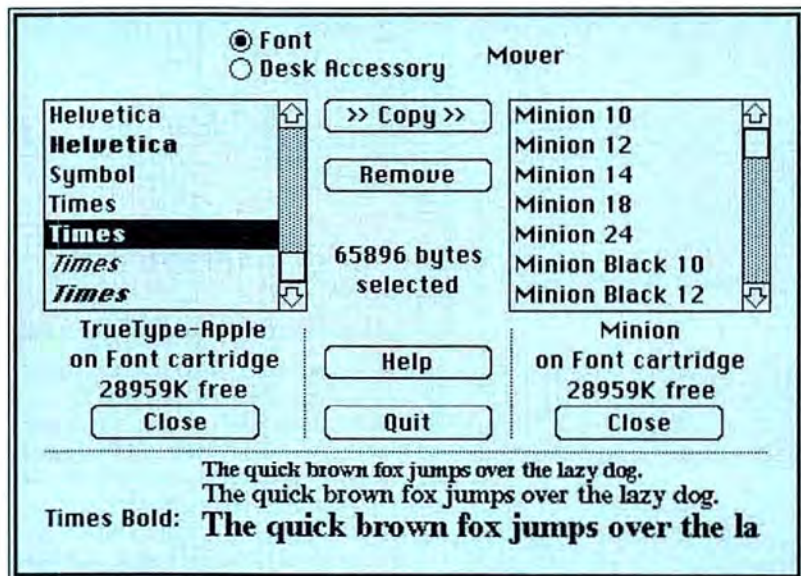


Figure 2: To install TrueType fonts in Systems 6.0.5 and 6.0.7, you must use Font/DA Mover 4.1. TrueType fonts show up as styled names (left-hand window); if you select a font name, the type sample (bottom) displays it in three different sizes. A bit-mapped font, on the other hand, contains only a specific point size (right-hand window) and is displayed as a single type sample.

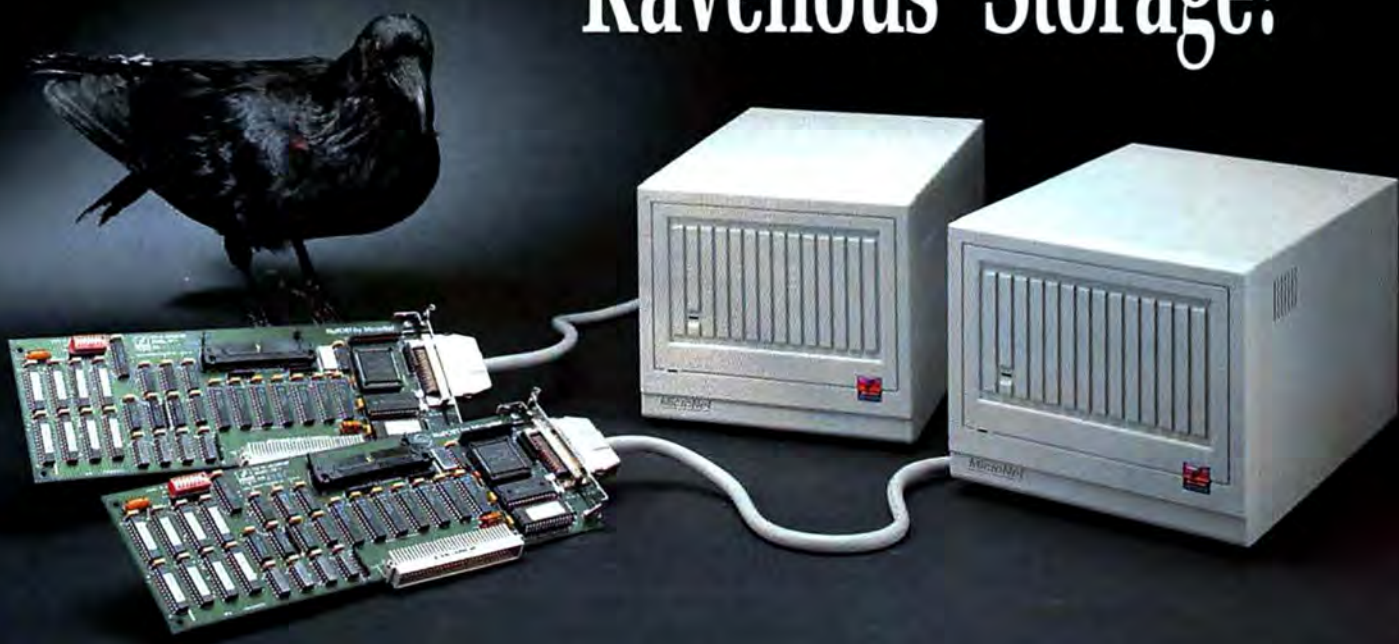
Font Formats

Digital typefaces can be stored on the Mac in one of two ways: as fixed-sized bit maps or as scalable outlines (see Figure 1). In a *bit-mapped font*, each character is stored as a static arrangement of dots (also called bits or pixels). Bit-mapped fonts are created in specific point sizes — usually 10, 12, 14, 18, and 24 points — and are crisp and legible only at these sizes. If you select any other size, you get the infamous "jaggies," a coarse, stair-stepped appearance that makes text nearly impossible to read. The Mac's core fonts — Chicago, Geneva, Monaco, and New York — have always been bit-mapped fonts; they are available in System 7 as TrueType (outline) fonts, however, and you can choose

to install either format. Bit-mapped fonts are also called *screen fonts*, because the Mac's operating system has traditionally used them to display text on-screen.

In an *outline font*, each character is stored as a mathematical formula that describes the lines, curves, and points that make up its shape. This outline is scaled to a requested size and then converted to the pattern of pixels that most accurately fills the letterform. Both Type 1 and TrueType fonts are stored as outlines, which have several advantages over bit maps. First, the scaling and pixel-painting routines are separate, enabling outline fonts to be smoothly resized and output at any resolution — the 72 dpi of the Mac's screen, the 300 dpi of a laser printer, or the 1,200 dpi

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(and up) of an imagesetter. Second, outline-font files take up less disk space than do their bit-mapped cousins, because the mathematical data is more compact than bit maps and because only a single file is required to produce text at any size and resolution. Third, text created with outline fonts can be manipulated in various ways — slanted, skewed, or rotated, for example — and still appear sharp and free of distortion.

Bit-mapped and outline fonts have different icons and are installed in different ways. For System versions through 6.0.7, bit-mapped-font files contain one or more styles and point sizes, have suitcase icons, and are installed into the System file with Font/DA Mover (see Figure 2). Under System 7, each style/size combination of a bit-mapped font is stored as a separate file that has a document icon bearing a capital letter A. You install the fonts by dragging the font icons on top of the System-file (or System Folder) icon. (Alternatively, you can install bit-mapped fonts by opening them with Suitcase II; System 7 users need version 1.2.10.) The installation of outline fonts, on the other hand, depends on which format you're using: Type 1 or TrueType.

Type 1. The Type 1 font format is a subset of PostScript, a page-description language developed by Adobe Systems that describes how to render pages of type and graphics at any resolution on a wide variety of printers, imagesetters, and other devices. Type 1 is a proprietary format, and until March 1990, only Adobe and its licensees could create Type 1 fonts. Once Adobe released the Type 1 specifications, however, every font vendor — from major type houses such as Agfa Compugraphic, Bitstream, and Monotype to smaller shops such as The Font Company and Casady & Greene — began creating Type 1 fonts. Today even commercial font-creation tools such as Fontographer and FontStudio can produce Type 1 fonts.

To use a Type 1 font, you actually need two separate files: a bit-mapped screen font, which is required for proper installation and screen display, and the Type 1 outline file, often called a *printer font*, because it's used mainly for producing output on a PostScript printer. The screen font is installed as any other bit-mapped font is and provides the necessary data about font metrics (kerning and character widths, for example), line spacing, and the structure of the font family. This information, plus any on-screen formatting you do, is used when the printer font is scaled

If you don't own any Type 1 fonts and most of your work is printed on a non-PostScript printer, you'll gain a great deal with TrueType.

for output. You install the Type 1 printer fonts by dropping them into the System Folder; their icons vary by manufacturer (Adobe's icon of horizontal lines with a superimposed italic A may be the most familiar).

Until recently, working with Type 1 fonts had its drawbacks. Bit-mapped screen fonts were poor indicators of what Type 1 output would look like, and performing typographic adjustments on jagged text could be a nightmare. In addition, only PostScript printers could correctly render a Type 1 printer font. Two years ago, Adobe solved these problems with ATM (Adobe Type Manager). Simply pop this PostScript-based INIT into your System Folder, and it will use the outlines stored in the Type 1 printer fonts to produce sharp, legible text on-screen at any size. ATM also eliminates the need for most screen fonts (you need to install only a single point size for each font), and it enables you to output good-looking text on non-PostScript printers, including the ImageWriter, the DeskWriter, and the Personal LaserWriter LS.

(You may have heard of another PostScript font format called Type 3. Font vendors used this format to create PostScript fonts before they had access to the Type 1 specs. Type 3 fonts don't usually look as sharp and clean as Type 1 fonts do, their files are larger, and they don't work with ATM. Today Type 3 is a dying format; its only real benefit is that it can contain graphic features such as gray scale, graduated fills, and variable stroke weights.)

TrueType. Apple's new TrueType technology competes directly with Type 1 fonts as rendered by ATM. TrueType fonts provide crisp, legible type on-screen, and they print at the maximum resolution of PostScript, QuickDraw, and TrueImage printers. Under System 7, TrueType has one major advantage over ATM: It's part of the Mac's operating system, whereas ATM is simply another INIT. These formats are more comparable in Systems

American Text
 Baskerville
Embassy
 Gatsby Demi
Goudy Extra Bold
 Meath
 Memphis medium
 Present
Times New Roman

Figure 3: These TrueType faces are among those currently available from Bitstream (American Text, Baskerville, and Embassy), Casady & Greene (Gatsby Demi and Meath), Linotype (Memphis medium and Present), and Monotype (Goudy Extra Bold and Times New Roman Extra Bold). The 24-point samples were output at 300 dpi on a LaserWriter IINTX.

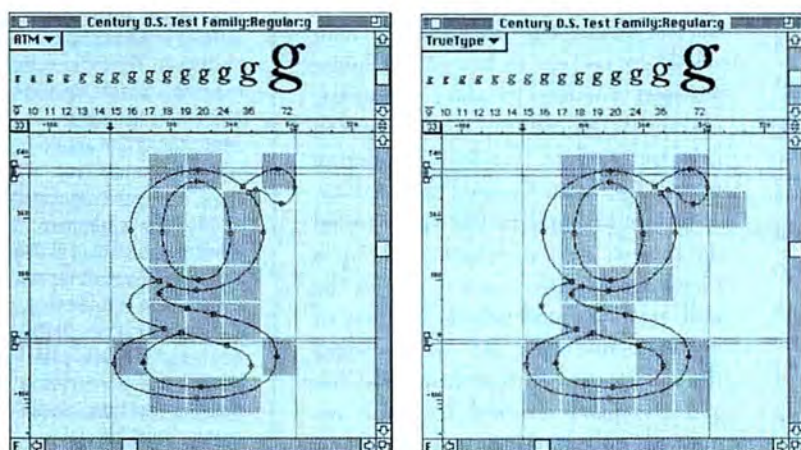


Figure 4: Type 1 and TrueType take different approaches to hinting, the instructions that determine which bits are switched on whenever there aren't enough pixels to show the character accurately. Here, Letraset's FontStudio shows the hinting differences for a 9-point character that will be output at 300 dpi. The rasterized bit map for the Type 1 character (left) looks dramatically different from the one produced by TrueType (right). In both cases, the bit map is superimposed over the original character outline.

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6.0.5 and 6.0.7, where TrueType is implemented as an INIT too. (The TrueType INIT ships with Apple's StyleWriter and Personal LaserWriter LS printers and is also available free from many dealers, on-line services, and user groups.)

TrueType fonts are easier to install and use than Type 1 fonts, because they don't require bit-mapped screen fonts. A single outline-font file provides all the information necessary for both screen display and output, in every point size and at every resolution. To install a TrueType font in System 7, just drag the font icon over the System Folder icon — the font is automatically installed in the System file. You can even see a type sample by double-clicking on the font icon. To install

If you have an investment in Type 1 fonts or PostScript software and hardware, avoid TrueType for the time being.

TrueType fonts in Systems 6.0.5 and 6.0.7, you need version 4.1 of Font/DA Mover (see Figure 2).

If you plan to use TrueType fonts in documents that were originally composed with Type 1 fonts and you don't want slight differences in character spacing to cause lines of text to break differently, you should install the original bit maps that

come with the Type 1 fonts, along with the TrueType versions of the fonts. The font-metrics data stored in the bit-map files will then control character widths, kerning, leading, and other formatting details.

There are other reasons why you might want to install one or two bit-mapped fonts (say 10 and 12 points). First, a hand-tuned bit map often looks better on-screen, particularly at small point sizes. Second, the Mac can display a bit map much faster than it can rasterize a font from an outline. However, some TrueType vendors such as Bitstream and Monotype are not (yet) providing bit-mapped fonts with their TrueType releases, so you may have to live without the benefits of bit maps.

Most type foundries — except Adobe,

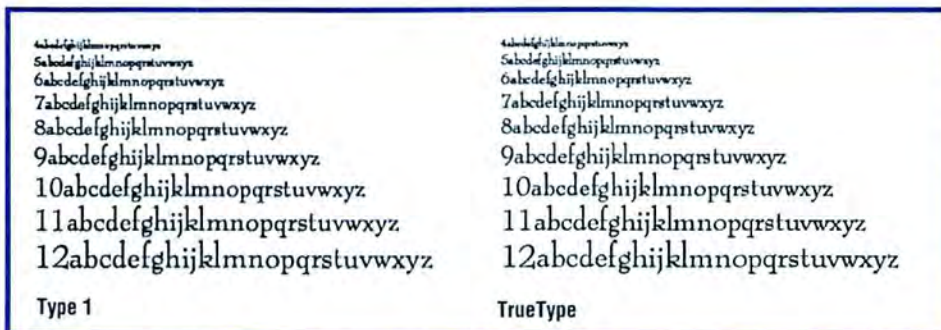


Figure 5: TrueType fonts really shine at small point sizes. Here, the TrueType version of Bitstream's Bernhard Modern (right) is as legible at 5 points as the Type 1 output is at 8 points. Both waterfalls were printed at 300 dpi on a laser printer.

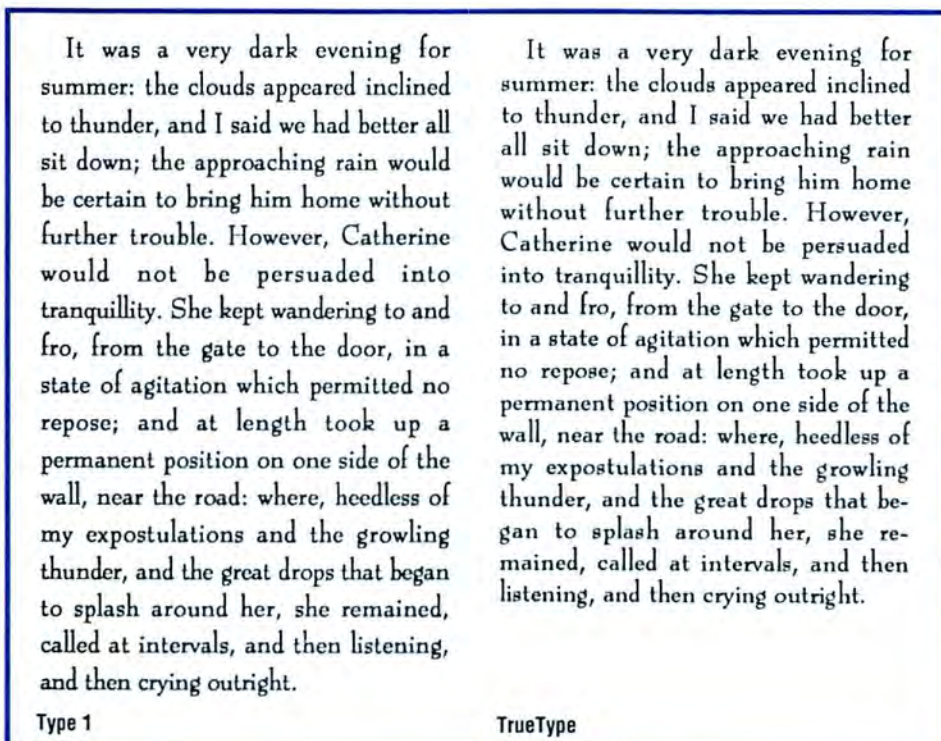


Figure 6: Type 1 and TrueType have subtle differences in character spacing that can create havoc if you switch font formats in an existing document. The differences are most apparent in word processors and other applications that aren't typographically savvy. Here, a 10-point paragraph of Bitstream's Bernhard Modern was printed at 300 dpi, with Microsoft Word's default Auto line spacing. The Type 1 sample (left) has looser intercharacter spacing and more leading than the TrueType version (right), which results in different line endings and column lengths.

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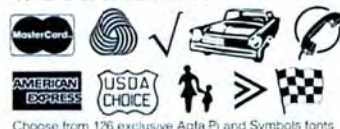
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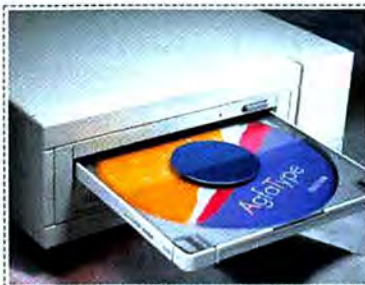


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of course—are releasing fonts in TrueType format (see Figure 3), although it will be some time before a substantial TrueType library is available. (For sources of TrueType fonts, see “TrueType Arrives,” July '91, page 181.) You can also convert Type 1 fonts into TrueType format (and vice versa) with a font-conversion utility such as Metamorphosis Professional or FontMonger or a font-creation application such as Fontographer, FontStudio, or ATF Type Designer I. The quality of the converted fonts won't match that of a font created by a type designer, but when printed at small sizes on a 300-dpi laser printer, converted TrueType fonts are often more legible than the Type 1 originals.

Hints and Other Mysteries

Both Type 1 and TrueType put type onto the page in an elegant process that involves the outline fonts and a rasterizer—a collection of software routines that performs the three steps necessary to interpret (rasterize) the outlines: scaling, hinting, and scan conversion. The rasterizer can be stored in the printer (as with a PostScript RIP [raster-image processor]), in the Mac's System file (in the case of TrueType), as a separate, external application (as with ATM, Freedom of Press, or the TrueType INIT), or within the font file itself (as with TrueType again). A key difference between TrueType and Type 1 fonts is that the TrueType fonts themselves contain part of the rasterizing code whereas Type 1 rasterizers are always separate programs. Apple claims that putting some “intelligence” into the fonts gives designers more control over how a font will display and print; Adobe says that keeping the rasterizer separate makes it easier to update the technology—to upgrade, you just replace ATM, for example, not your entire font library.

No matter where the rasterizer is, it works the same way. When you display a document on-screen or tell an application to print it, the scaling software fetches each character's outline and sizes it to your specifications. Next, the hinting routine matches the resized outline to a theoretical grid of pixels that's been scaled to match the resolution of the specified monitor or printer. Finally, the scan converter turns the outline into a bit map by switching on just those bits that fall inside the character outline. (Remember, a monitor or printer can produce only pixels or dots.)

The most complex part of the process is

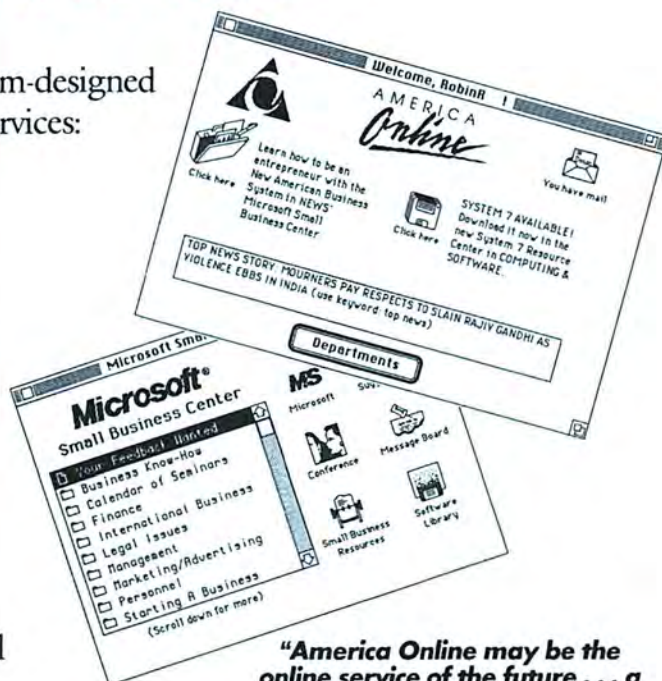
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TYPE

Apple claims that putting intelligence into the fonts gives designers more control; Adobe says keeping the rasterizer separate makes it easier to update the technology.

the hinting routine. Paradoxically, this is the most discussed element of outline fonts yet it remains the most mysterious. *Hints* are instructions for adjusting a character's outline to achieve the most accurate, legible image at every resolution. Each character has its own set of hints, which are stored in the font file. Hints are particularly important at small point sizes and at low resolutions. When there are only a few pixels available, the character's outline must be moved or altered to fit the pixel grid, a technique called *grid fitting*. Without hints, a character's stems could land between two pixels and not print at all, or nearly identical stems might print in different weights. Hints specify the type and amount of grid fitting that can be applied to a character. As the type size and/or the output resolution increase — providing more pixels for displaying the character — the effects of hinting dwindle until there's no discernible effect. Hints thus mainly affect small type sizes at low resolutions and are rarely needed at resolutions above 600 dpi.

Probably the most significant difference between Type 1 and TrueType fonts is in their hinting languages (see Figure 4). Type 1 hints are simple declarative instructions that define the extent to which character elements can be distorted for low-resolution output. They affect such features as the position and weight of stems; the position of terminal parts of characters; the relationship of characters to baseline, x-height, and cap-height measurements; dropouts (missing pixels); and boldness. TrueType hints (or *instructions*, in Apple terms) are much more complex and give greater freedom to the type designer, who can choose to alter more parts of each character with greater specificity. For example, TrueType hints can not only control stem width but can also preserve the logical symmetry in the arches of a lowercase *m*.

The TrueType format also supports more-sophisticated instructions that go

beyond the hints that preserve character shapes at low resolution. For example, TrueType fonts could be optically scaled — that is, instead of just being resized, outlines could be re-proportioned to make characters more graceful, better fitted, and easier to read in different type sizes. Unfortunately, optical scaling and other advanced features cannot be implemented until Apple adds the necessary typographic-support features (called Line Layout Manager) to the operating system, which may not be for a year or more. Type vendors will then need to rework existing TrueType fonts to support the new features. Meanwhile, as mentioned earlier, Adobe has announced the Multiple Master technology, which offers a slightly different approach to optical scaling and other typographic niceties. Adobe plans to ship the first Multiple Master fonts by early 1992, which puts Type 1 ahead of TrueType in this technological race.

Putting It on Paper

When you print a document containing Type 1 fonts, the printer driver checks first to see if the requested fonts are in the printer's ROM or RAM or on an attached hard disk. If so, the fonts are rasterized and printed by the printer's PostScript RIP. If the fonts aren't available in the printer, the driver downloads the necessary printer fonts from your Mac's hard disk. If you use ATM and have the printer fonts on your hard disk, you can also print Type 1 fonts on non-PostScript printers (ATM will do the rasterizing).

Printing TrueType fonts is also straightforward — as long as you aren't using a PostScript printer. For a 72-dpi printer (an ImageWriter, for example), the printer driver sends the TrueType screen image straight to the printer. For QuickDraw or TrueImage printers with higher resolutions (the Apple StyleWriter or Microtek TrueLaser, for example), the font is first rasterized at the printer's resolution and then the driver sends the image to the printer.

If you're using a PostScript laser printer or imagesetter, however, the printer driver will do almost anything to avoid rasterizing the TrueType outlines. (Note that version 6.1 or 7.0 of the LaserWriter driver is required for outputting TrueType fonts.) The printer driver first assumes that a Type 1 font is being printed; only as a last resort does it actually use the TrueType outline. Here's a synopsis of the driver's activities, which are handled transparently

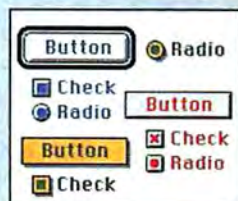
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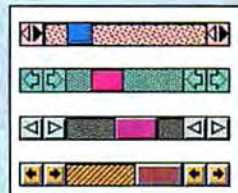
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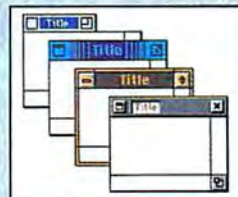
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TYPE

once you've issued the Print command:

- The driver searches the printer's ROM, RAM, and any attached hard disk for a Type 1 outline or cached bit map with a matching name. If it finds one, the PostScript version will be printed.

- Next, the driver checks the Mac's System Folder for a matching Type 1 printer font. If found, the Type 1 font will be downloaded to the printer, where the PostScript RIP can rasterize and print it.

- If all Type 1 searches fail, the driver will check to see if a TrueType font was used in the document. If so, it will send the TrueType outline and rasterizing software (the TrueType Scaler) to the printer.

- But wait — the driver also checks to see whether the printer has enough memory available to rasterize and print the TrueType font. If it doesn't (a possibility with older LaserWriters), the clever TrueType software converts the font into an unhinted Type 1 outline (!) and has the printer's PostScript RIP print that.

There is one situation in which a PostScript printer can't print a TrueType

Most type foundries — except Adobe of course — are releasing fonts in TrueType format, although it will be some time before a substantial TrueType library is available.

font at all: if you use the TrueType version of a Type 1 font that's burned into the printer's ROM. Times Roman is a good example. Regardless of what you see on-screen, the Times Roman stored in the printer is what will appear on paper. In all of these scenarios, of course, the TrueType and Type 1 names must match — the software will not substitute a completely different Type 1 typeface for the TrueType font you've specified.

Finally, there's the speed issue. TrueType fonts take much longer to print on a PostScript printer, and you can't use as

many fonts on a page without running into memory errors. Both problems arise because the TrueType rasterizer is downloaded, used, and flushed out of memory along with each TrueType font.

Beauty Contest

At this point, you may be asking: Why *should* I insist on printing a TrueType font? Are TrueType fonts really better-looking and more typographically "correct," as Apple claims? These are tough questions to answer, because so few commercial samples of the new format are available, but the TrueType faces released thus far certainly appear to be every bit as good as their Type 1 counterparts.

Individual characters may look slightly different between TrueType and Type 1 versions of the same typeface, because the two formats use different types of curves to draw letterforms. Type 1, like other PostScript graphics, is based on cubic curves (Bezier splines), whereas TrueType uses quadratic curves (B splines). A Type 1 outline usually has fewer control points,

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because cubic curves calculate each point with greater precision. TrueType fonts have more points that are described less precisely (theoretically, this makes them faster to render). Although the two types of curves may produce small differences in character outlines, these discrepancies are rarely visible or significant.

TrueType does have the edge over Type 1 at low resolutions (see Figure 5). TrueType fonts printed at small sizes (say, 4 to 8 points) by 300-dpi laser printers or the 360-dpi StyleWriter are more legible than the Type 1 versions, with relatively open counters (openings within characters) and finer strokes. This edge in readability persists well into normal text sizes (10 to 12 points). If you produce your documents at 300 dpi, TrueType will give you visible advantages. When we sent output to a 1,270-dpi imagesetter, however, there were no visible differences between the TrueType and Type 1 versions of the same font.

Character spacing is another important typographic quality. Well-spaced type makes text more attractive and easier to read, but there are practical aspects too. If the spacing in the TrueType version of a font is different from that in the Type 1 version, documents created in one format may recompose with different line endings and column lengths when opened with the other. This can be a headache if, say, you have already completed page layouts but need to switch font formats.

Type vendors say they are matching character widths and spacing between Type 1 and TrueType versions of their fonts, but even so, Type 1 fonts seem to have better built-in spacing controls than their TrueType cousins. Most page-layout programs — PageMaker and QuarkXPress, for example — are typographically savvy and compensate automatically for these differences by using all the spacing data built in to the fonts. Our Type 1 and TrueType test pages looked almost identical when printed from PageMaker, with no differences in line endings and only minor leading changes.

Unfortunately, applications such as word processors are generally not type-trained and take only minimal data from the font file (often just type size and width). Because of this, you are likely to see significant differences in line endings and spacing when switching between Type 1 and TrueType fonts (unless you keep the bit-mapped fonts originally used to format the document). We found Microsoft Word


to be particularly troublesome in this regard, because of its auto-spacing feature (see Figure 6).

The Bottom Line

It's too soon to tell whether TrueType will become a big success and validate Apple's enormous investment. Despite its potential for high typographic quality, TrueType seems to be aimed at Mac users who don't have a professional interest in typography, whereas Type 1 is well entrenched at the high end — the designers, ad agencies, service bureaus, and color-prepress houses who work extensively with type, day in and day out. We could end up with a dual font standard, split between professional (Type 1) and casual (TrueType) type users.


Ironically, the Mac community may not really have a say in TrueType's fate. Windows 3.1 also has TrueType built in, and it brings to the PC world a major benefit Mac users have long enjoyed — one font format for all applications. Thus, hordes of PC users may cast the deciding votes on TrueType. If they are ready to support the format with their checkbooks and credit cards by buying additional fonts and sending documents to output services, Mac users — even diehard Type 1 supporters — may be swept along with the tide.

So, should you embrace TrueType or eschew it? TrueType is the obvious and sensible choice if you're just starting to use a Mac, don't own many Type 1 fonts, or will be printing most of your documents on non-PostScript printers. TrueType is easy to install and use, and it really shines at low resolutions. Under those conditions, TrueType could simplify the Mac part of your life. (If you'd like to bone up on Mac typography, get *The Macintosh Font Book*, second edition [Berkeley, California: Peachpit Press, 1991].)

The choice is equally clear for type-oriented users who rely on PostScript for graphics and page layout, own a PostScript printer, send files to service bureaus for output, or have a sizable investment in Type 1 fonts. If this is you, avoid TrueType for the time being. Wait until a wide selection of typefaces is available, until service bureaus are supporting output of TrueType fonts, and until others have discovered and solved the day-to-day problems of working with two type formats. 

Contributing editor Kathleen Tinkel is a type-loving graphic designer and copublisher of *MacPrePress*, a weekly faxed newsletter.

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		1000000	1000000	1000000	1000000
Manager		1000000	1000000	1000000	1000000
		1000000	1000000	1000000	1000000

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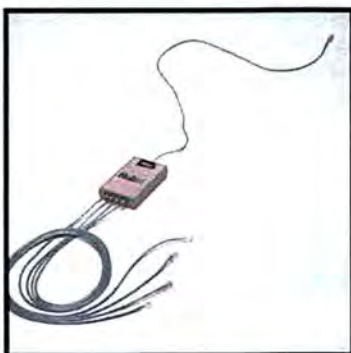
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While we're waiting for Apple to come out with a portable portable, NEC has shipped a portable that weighs more than the Mac boat anchor. The NEC ProSpeed 486SX/C does have a good excuse, though. That C stands for color — 8-bit, 640-x-480-pixel, Super VGA Thin Film Transistor active-matrix color, to be precise. Oh, yes, the weight: 16.8 pounds.

By Henry Bortman

Hubs, hub: Nuvotech is offering the first 24-port, rack- or wall-mount LocalTalk hub, dubbed NuvoStar, for \$1,495. This is good news for people with large networks. Previously, LocalTalk hubs were limited to 12 or 16 ports. ➡ Meanwhile, newcomer Rad Advanced Networks ([201] 587-8822) is marketing its MiniStar 8-port LocalTalk hub for the VLP (very low price) of \$850.

Ether hubs: The field for 10BASE-T Ethernet hubs is expanding too. For example, NRC ([408] 263-8100) is offering the innovative 24-port MultiGate Hub. One of the hub's ports can be configured as a "learning/filtering bridge," so that in large networks with multiple hubs connected to a corporate backbone, traffic between nodes on the same hub can be kept off the backbone. In addition, protocol-based filtering can restrict backbone access to only certain types of protocols, such as TCP/IP. It also offers extensive Mac-based management capabilities. \$3,495. ➡ Asanté's hub has less smarts and fewer ports (twelve 10BASE-T ports plus one each for thin coax and AUI), but at its new price of \$995 (down from \$1,395), it costs significantly less. ➡ And, if you've been thinking about making the switch to 10BASE-T but haven't

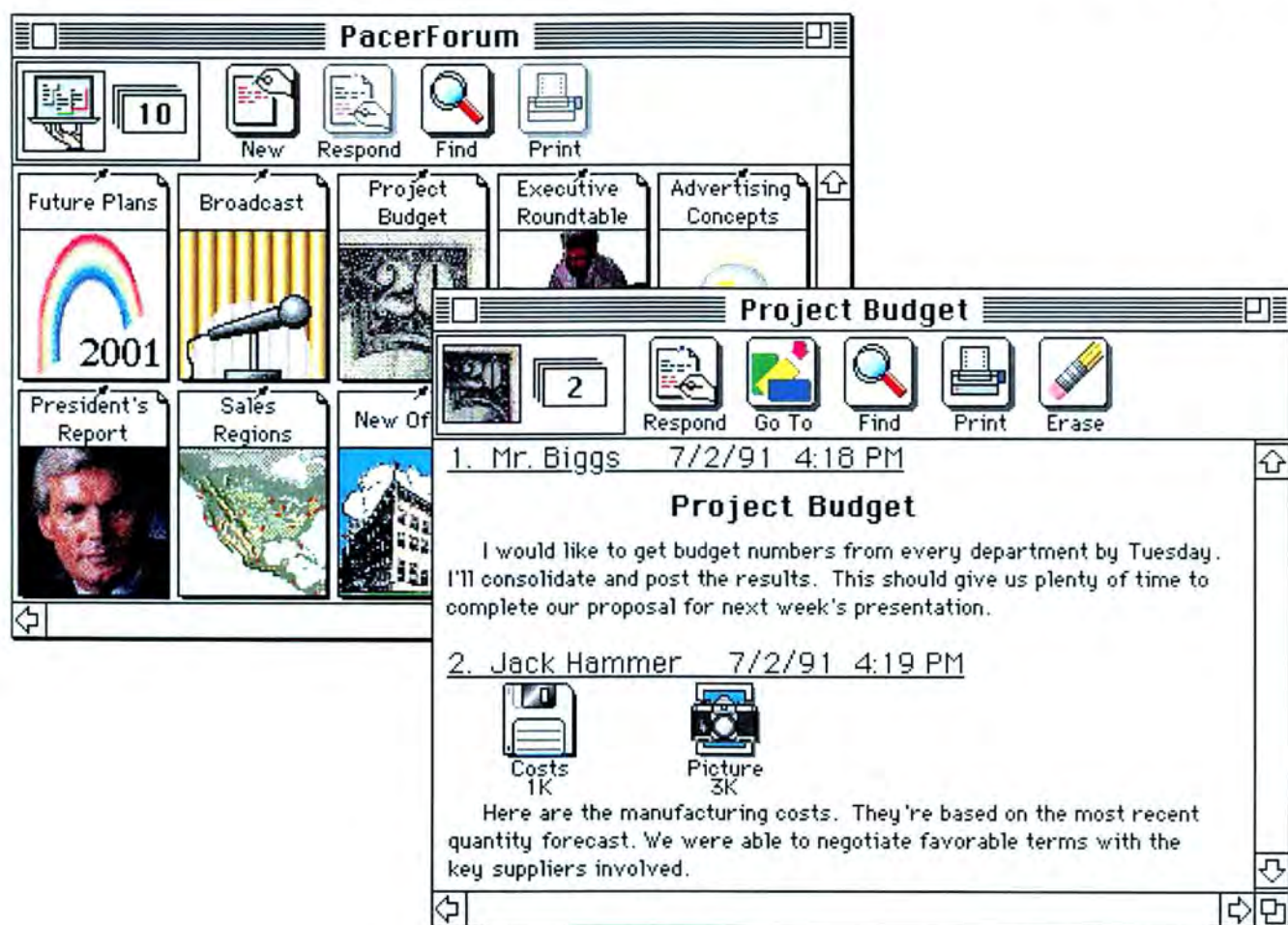


figured out how to support users with more than one network device in their offices, check out Shiva's Hublet. It enables each 10BASE-T run, which normally can support only a single device, to support up to four devices. Think of it as the equivalent of an AC power strip for 10BASE-T. \$399. ➡ One more cute 10BASE-T device: Dayna's \$399 Dayna-PORT E/Z, an Ethernet interface that connects to the Mac's serial port. A real lifesaver

for users of Macs (such as the Classic) without a card slot or whose slots are filled with other cards. The box also supports thin-coax, AUI, and fiber-based Ethernet connections.

Mail call: For the user or network manager who collects mail gateways, here are a couple of new ones. Solutions ([802] 865-9220) will soon ship Comm GATE/QM, which lets QuickMail users exchange mail messages — and files — with MCI Mail users. \$395 for five users, either Mac or DOS. ➡ Information Electronics ([607] 257-5840) is offering SMTP/QM, a gateway between UNIX-based SMTP (Simple Mail Transfer Protocol) and QuickMail. With TCPack, a TCP/IP connection tool that's included in the bundle, you can use your QuickMail server as an FTP (File Transfer Protocol) server as well. \$749 per QuickMail server, regardless of number of users. ☐

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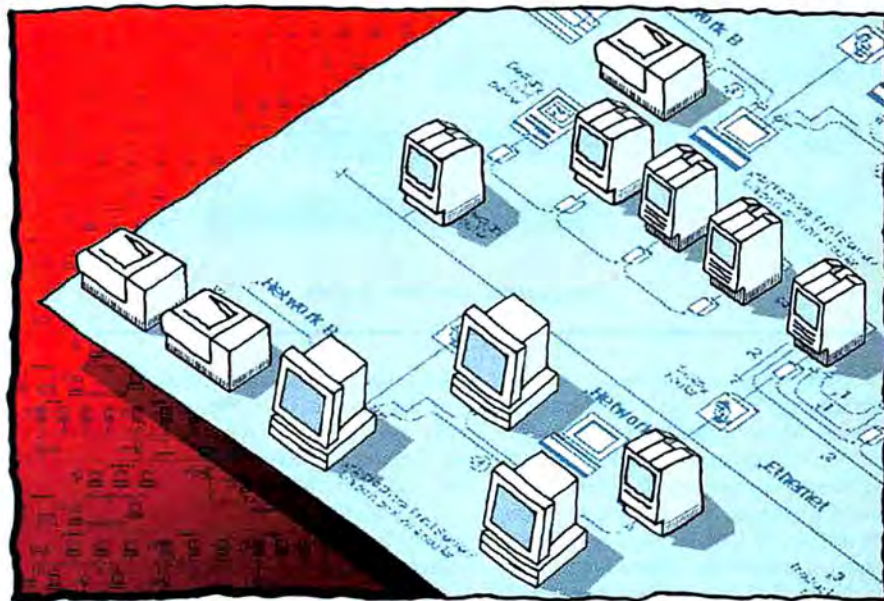
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Maximum Mac Management

You already use the Mac to keep track of your network. Here's how to use the network to keep track of your Macs.

By John Rizzo



Seasoned Mac veterans sometimes look back wistfully to the good old days of Mac networks, when resource management was simple. The ten Macs on the network were almost identical and contained three user applications: MacWrite, MacPaint, and Excel. These days, network administrators deal with scores of users; a dozen Macintosh models; and hundreds of versions of peripherals, drivers, INITs, and applications—all of which may or may not work with each other or with System 7.

Fortunately, you don't have to rely on shoe leather alone to keep track of everyone's workstation setup. Network-management software exists that tells you what NuBus boards, System software, fonts, applications, and other software and hardware is running on every machine on the network. These are not the type of applications that look at the network infrastructure—the traffic, events, and packets that cross the wires (for more on such utilities, see "Networks: Under New Management," August '90, page 226). Rather, network-management programs give you a higher-level look at the network, probing and recording the resources at the end of the wires. They enable you to collect data in a few minutes that would otherwise take weeks. You can use this data to provide faster and better technical support for users and to troubleshoot a problem without leaving your desk.

Most of these products are already into their

second-generation versions. Pharos has released version 2.0 of Status•Mac, which no longer requires a mail or file server for sending messages across the network, as it did in the original version. GraceLAN, from Technology Works, is also in version 2.0, and Radar, from Sonic Systems, was scheduled to go to its 2.0 version this summer. Network SuperVisor 1.0.6, from CSG Technologies, hasn't been updated recently.

We tested all four products on MacUser's multizone internet, which contains Macs running under both System 6 and System 7. The programs are all System 7-compatible; two of them—GraceLAN and Status•Mac—include balloon help.

An Inside Look

The four programs share similar features: They all come with a special *responder* INIT (not to be confused with Apple's Responder) that you put into the System Folder of each Mac on the network. The network administrator's Mac runs the network-management software, which gathers information by sending a request over the network, asking the INIT to do a scan (also called a *profile*) of the resources on each user's Mac. Information about INITs, versions of System and application software, hard drives, monitors, and other hardware is sent back to the administrator's Mac. The applications differ in how they gather the information and what happens to the

Figure 1: Scanning Speed

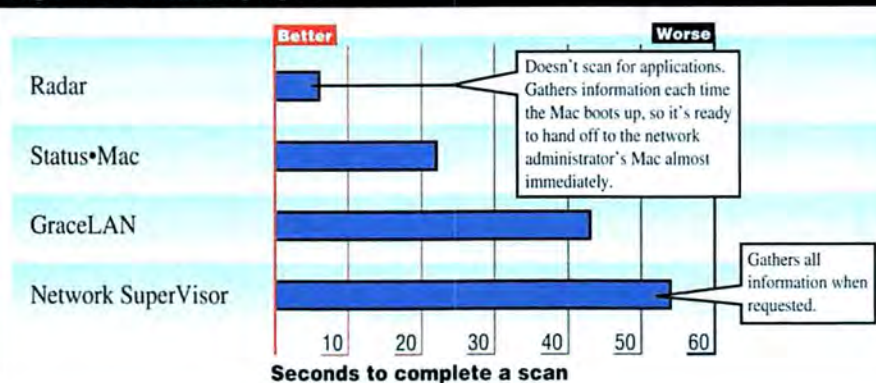


Figure 1: How fast network-management software gathers information from Macs on the network is important, because you want to disrupt users' work as little as possible. *MacUser* tested the four programs' scanning speeds with a IIci running under System 7 scanning a IIci running under System 6.0.7.

information when it returns to the network administrator's Mac. Let's consider what happens when the data is gathered.

If you're not careful, collecting data with network-management software can turn you into your colleagues' enemy. On the surface, the issue seems to be merely a matter of philosophy: Should Big Brother be allowed to snoop on everyone, or do companies have the right to know what is going on with their resources? However, these questions are moot in this case, because none of these programs can read data files, so no one is going to see the letters to your congressman that you may have on your hard disk.

The real issue is that these programs can hamper office productivity by interrupting users at a critical moment in their work. Scanning a Mac can interrupt it for anywhere from five seconds to several minutes, depending on the program you use and the configuration of the user's Mac — the more volumes and software on the target Mac, the longer the interruption. If interruptions become a nuisance, users may remove the network-management software's responder INIT from their System Folders, forcing you to go back to using your feet to collect data.

One way to avoid antagonizing your colleagues is to use a program that scans quickly and doesn't bog down the target Mac. Radar's scan was the quickest of the four products in our testing and causes the least slowdown of the user's Mac during a scan (see Figure 1). Part of the reason for the speed is that it doesn't scan for applications — which is a problem if you need that information. Status•Mac came in second in terms of speed, but, unlike Radar, it takes over the user's Mac completely in the process. GraceLAN's scan took twice

as long as Status•Mac's, but it doesn't take over the scanned Mac. Network SuperVisor has the slowest scan, but it takes over the user's Mac only when looking at INITs and applications.

One of the reasons Radar and Status•Mac are faster than the other two products is that they use ADSP (AppleTalk Data Stream Protocol), which enhances AppleTalk's data-transfer capabilities. ADSP comes in the form of an INIT for System 6 users and is built in to System 7 (the ADSP INIT is included with both Radar and Status•Mac). ADSP provides network applications with a direct pipeline from one Mac to another, making

data transfers fast and reliable. Neither GraceLAN nor Network SuperVisor uses ADSP.

How each of the applications gathers data also influences its speed. For example, Status•Mac's responder INIT gathers information only when a request from the network administrator's Mac comes over the network. In contrast, Radar's responder INIT gathers its information each time the target Mac boots up. As a result, the user waits a few seconds at startup, but the data is ready to be sent over the network when the Radar application on the network administrator's Mac sends a request for information. Although

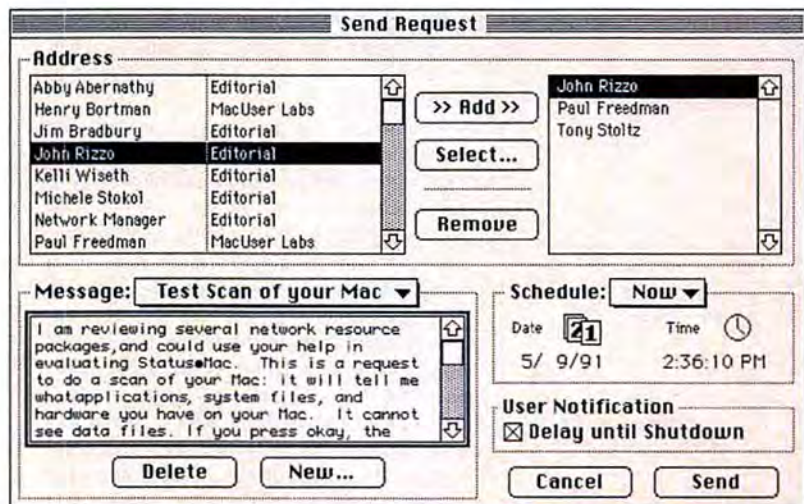


Figure 2: Dealing with a scan's interruptions and performance limitations can be a real annoyance to a network administrator's colleagues. To alleviate this, Status•Mac gives the administrator the option of scanning Macs at a time that will be most convenient for everyone. The Send Request window lets the administrator send a scan request immediately, at a set time (during a lunch break, for example), or at shutdown. Status•Mac also lets users delay a scan to a more convenient time.



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GraceLAN gathers most of its information after it's requested, it uses Radar's technique to a lesser degree by gathering application information at startup. This is one reason it's faster than Network SuperVisor, which, like Status•Mac, gathers all of its information only when it's requested to do so.

Radar's method of gathering information at startup has its price. Radar doesn't recognize any removable volumes, such as SyQuest or erasable optical cartridges unless they were inserted before startup. (GraceLAN scans cartridges inserted after startup but doesn't collect their application information because it gathers this information only at startup.) In addition, in *MacUser's* tests, Radar could not see fonts stored by Fifth Generation's Suitcase II. Because INITs load alphabetically, the Suitcase II INIT loads after Radar has collected its data. Sonic Systems should have a fix for this problem by the time you read this. (Alternatively, you can change the name of the Suitcase II or Radar INIT so Suitcase II loads before Radar.)

Network SuperVisor's responder INIT conflicts with version 1.2.9 of Suitcase II, causing interference with AppleTalk and preventing the Network SuperVisor application from seeing the Mac. A later version of Suitcase II may avoid this conflict (1.2.10 is now available).

Scheduling Scans

Although a Status•Mac scan takes over a Mac for a short time, it has the most useful set of solutions to prevent interruptions of users. Status•Mac is the only program that warns users before a scan takes place and gives them the option of delaying it. When the network administrator's scan request (which Status•Mac calls a Profile Request) appears on the user's screen, the user can choose to approve the scan or delay it for any length of time. If the Profile Request gets no response, Status•Mac assumes that the Mac is unattended and conducts the scan after a certain time interval. In addition to setting this interval, the network administrator can also set Status•Mac to do the scan when the user shuts down (after the user chooses Shut Down, the scan takes place and then the Mac automatically shuts down) or at a specific time (see Figure 2). Status•Mac's Profile Request also allows the network administrator to send a message of any length; these messages can be stored in a pop-up window.

Although the other programs don't

On the Horizon

The next generation of network-management programs will be active participants — not only will they tell you what's wrong with a Mac setup but they'll even do something about it.

A new application from Pharos Technologies that's due to ship later this year promises to be one of the most interesting of the new generation of network-management products. The application, code-named Whirlwind at press time, uses an outgrowth of artificial intelligence that Pharos calls knowledge agents to automatically troubleshoot users' Macs and take corrective action. Knowledge agents offer users advice on third-party hardware and software as well as fix problems if the user wishes. For example, Whirlwind can tell users if they're using an older version of a word processor or spreadsheet than the company standard. When a user clicks on the Do It button, Whirlwind replaces the older version with the current version located on a file server.

Whirlwind also uses System 7's Apple events to do such things as automatically set up companywide software preferences. Because knowledge agents are created with HyperCard's HyperTalk language and extensions, you can add data specific to your office, such as information about applications your office may have created or modified.

Sonic Systems is also planning some enhancements for its next version of Radar, which should be shipping now. The 2.0 version will allow the network administrator to update any file on a user's Mac via Radar's report generator. Radar will use Apple's ADSP protocol to send updated files to a folder on the user's hard disk. Sonic Systems also plans to include varying levels of security, including password protection.

Technology Works has said that future versions of GraceLAN will be able to upgrade software over the network, but no shipping date for the versions was set at press time.

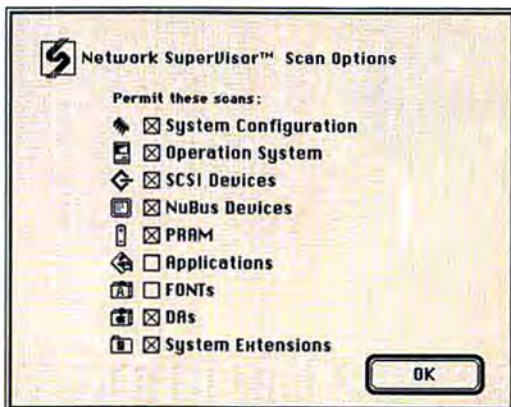


Figure 3: Certain network-management tools give users some control over what information the network administrator can access. Network SuperVisor's control panel can prevent the network administrator from scanning certain information such as INITs or applications. Users can also prevent the network administrator from doing such things as shutting down or restarting their Macs or taking screen shots.

Can Use Virtual Memory						
This report identifies workstations that have a Paged Memory Management Unit (PMMU) and virtual memory compatible Macintosh ROM versions. Useful for identifying workstations that can use the virtual memory feature of System 7.						
#	Profile Name (Prof Mgmt)	Zone Name (Prof Mgmt)	Machine Type (CPU)	RAM Size (CPU)	ROM Version (CPU)	PMMU Type (CPU)
1	Abby Abernathy	Editorial	Ilci	8192	1660	68030 MMU
2	Henry Bortman	MacUser Labs	Ilfx	8192	1660	68030 MMU
3	Network Manager	Editorial	Ilci	5120	1660	68030 MMU
4	Paul Freedman	MacUser Labs	Ilcx	8192	376	68030 MMU
5	Rohan Mahy	MacUser Labs	Ilcx	5120	376	68030 MMU
6	Tony Stoltz	MacUser Labs	SE/30	4096	376	68030 MMU

Figure 4: Gathering data with network-management software is only one step — you then need a database manager for organizing and analyzing the information. Status•Mac provides 75 templates that let you filter and import data for a variety of analyses. This template found the Macs on a network that are able to make use of System 7's virtual-memory capability. Each template contains a paragraph explaining the filter criteria.

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automatically warn users of impending scans, GraceLAN and Network SuperVisor have a message-sending feature so the network administrator can send a one-line message to selected users to warn them of an imminent scan — the users can't delay the scan, though. You can also use this message capability for sending messages such as "The mail-room printer will be down for the day" or "The mail server will restart at noon." Sonic Systems is planning to incorporate a similar message feature in its 2.0 version of Radar, which should be available now.

Only Status•Mac lets users delay a scan, but GraceLAN and Network SuperVisor give users the option of preventing scans or parts of scans by using a control panel that's part of the responder INIT. GraceLAN's control panel has four settings: Name and Machine Type, which allows GraceLAN to see only the Chooser name and type of Mac; System Info, which lets the program see System files and hardware information; All Info, which removes all scanning restrictions; and Make Changes, which lets the administrator make some minor changes, such as resetting the Mac's clock or updating the responder INIT. For those administrators who don't want users to be able to lock them out of their Macs, GraceLAN also provides another version of the control panel that doesn't include these options.

Network SuperVisor has even more such options, allowing users to prevent Network SuperVisor from seeing one or more of nine categories, such as fonts, applications, or System files (see Figure 3). Radar has none of these options.

Database Management

What happens to the information once it's been gathered? All the programs can print out reports, using templates that come with the program or that you design yourself. But to get the most out of your data, particularly on a large network, it's best to use some type of database manager for storing and cross-referencing information. One benefit of using a database manager is that the Macs you want to profile don't all have to be on at the same time — if some are having problems or are shut down and in locked rooms, you can scan those Macs later and then add the information to the database. Status•Mac and Network SuperVisor have built-in database managers. GraceLAN, which doesn't have a database manager, has templates for Claris' FileMaker Pro and

Microsoft Excel, to which you can export collected data. Radar is the weakest in this respect — it has neither a database manager nor an export command, although you can save reports as text. However, you can't perform any database functions,

such as sorts, on the text reports.

A unique feature of Status•Mac's database manager is its peer-to-peer store-and-forward architecture, which lets you send Profile Requests to Macs that are turned off. In such cases, the network

Instant Updates

Although future versions of network-management applications will let you update software over the network, one product available now — VersionTerritory 1.7, from SoftWriters — is specifically designed to do this. VersionTerritory uses ADSP to update applications, data files, or entire folders as well as delete old files. There is no way to warn users of an impending upgrade, so you'll have to tell them yourself. VersionTerritory sells for \$495.

Version 2.0 of VersionTerritory, expected now, will allow users to upgrade Apple System software from System 6 to 7. It does everything that Apple's Installer does, including moving fonts and DAs from the old System to the new. It also does something the Apple Installer doesn't do — install System 6 on top of System 7. Users may

find themselves doing this after discovering that their favorite application is not System 7-compatible.

SoftWriters also sells the 7•Updater, a cheaper version of VersionTerritory specifically designed for updating to System 7 over a network. Unlike Apple's Network Installer, which requires users to log on to a server and upgrade their own Macs, 7•Updater upgrades multiple Macs over the network by itself after the network administrator has launched it. 7•Updater installs the new System software; moves the System 6 DAs, fonts, control panels, and INITs into the appropriate folders; and restarts the Mac. 7•Updater costs \$99 for six users and \$249 for an unlimited number of users.

SoftWriters, Inc., P.O. Box 1308, Round Rock, TX 78680; (512) 244-3999.

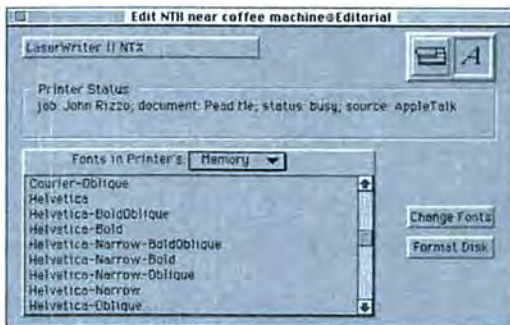


Figure 5: GraceLAN, Network SuperVisor, and Radar can all see printers on the network, but only Radar can update them by uploading or downloading fonts or renaming the printer. Radar has a built-in printer utility that can move fonts between a printer's memory and your Mac's hard disk.

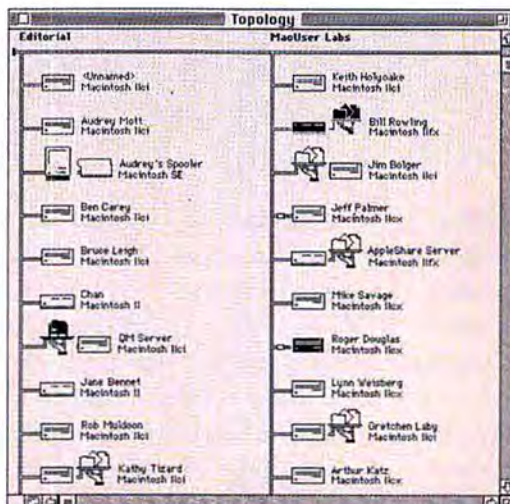
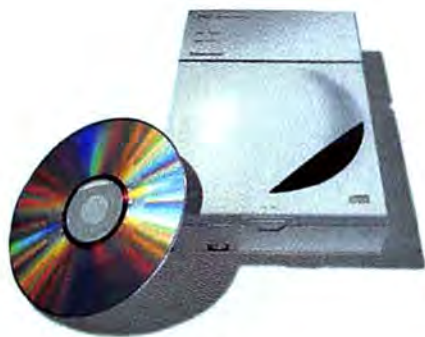







Figure 6: Several products do more than just gather information on the Macs or PCs on a network — they also provide some troubleshooting features. GraceLAN's Topology window creates a logical map of the network, showing users, file servers, printers, and other network devices. The tray icon attached to the right side of several of the Macs indicates that these Macs have AppleShare volumes that are available to the network via System 7's file-sharing feature.



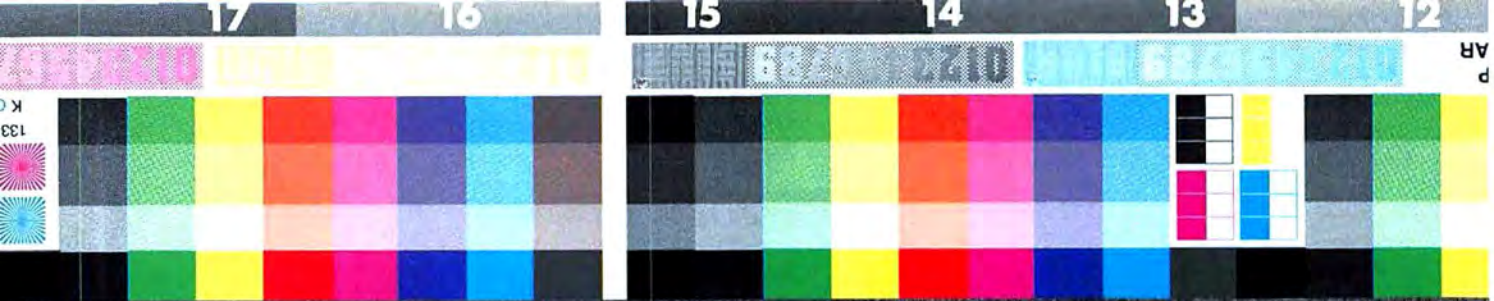
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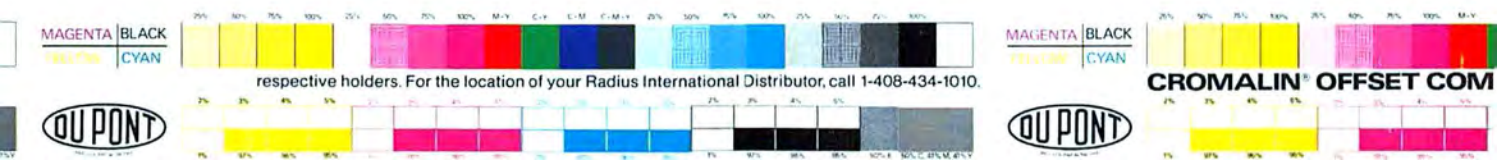
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administrator's Mac stores the request until the target Mac has been turned on. The request is then automatically sent in the background to that Mac without interrupting the network administrator.

A database is helpful for analyzing selected information. Let's say you're planning to purchase memory for users' Macs, so you need to know which machines contain 2 megabytes or less of RAM. If you used GraceLAN — which doesn't have a database manager — you would have to sort the list of Macs by the amount of memory they contain and then the program would have to go out over the network and collect the data again, even if you'd already done a general scan. With a database, however, after you've gathered all your information, you can compare specific data off-line without worrying about network traffic or needlessly interrupting users.

Status•Mac is particularly well suited for data analysis. It comes with more than 75 report templates you can use to sift

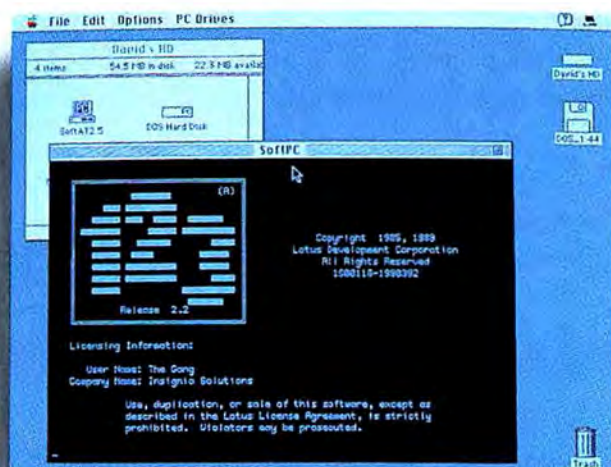
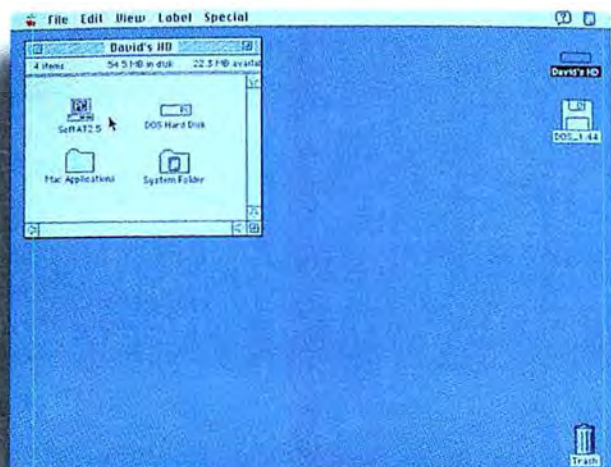
To get the most out of your data, you need a database manager to store and cross-reference information.

through the data for the facts you want. You can also build your own templates. With just the press of a button, Status•Mac filters and exports data from the master database (which contains all the information from your scans) into a template. Some of the templates display text on how to use and interpret the data you've gathered (see Figure 4). Pharos plans to expand Status•Mac's usefulness by introducing a product that uses artificial intelligence to act on the data gathered — to update programs, for example (see the "On the Horizon" sidebar).

One group of templates that Status•Mac

2.0 includes is the System 7.0 Readiness Kit, designed to help you convert the Macs on your network to System 7 (see "System 7.0 on a Network," July '91, page 199). New to the kit is the Status Checker, a HyperCard stack that works with Status•Mac and Apple's Compatibility Checker. Status•Mac's Status Checker takes the information in Apple's Compatibility Checker and makes the same type of upgrade recommendations for all Macs in the database at one time.

Network SuperVisor, which was built with ACIUS' 4th Dimension, sports a beefy database manager with many of 4D's data-manipulation features, such as powerful search and sort capabilities (the 4D application is not required to run Network SuperVisor). Network SuperVisor can also import and export a variety of file formats, including text, SYLK, 4D, and DIF (a DOS format). You can add non-network user information to the database, such as user phone numbers, purchase dates, and equipment prices. You



Click,
It's A Mac.

Click,
It's A Mac
And A PC.

can even add graphic data, such as photographs of users and floor plans.

CGS offers a version of Network SuperVisor that doesn't include the database manager. SuperVisor Jr. (\$249) offers increased speed and ease of use in return for its lack of a database manager. Sonic Systems also offers a cheaper version of its product, Radar Junior (\$299), that works the same as the more expensive version but without the reporting features.

Look and Feel

How easy these programs are to use and obtain information from is an important consideration. Network SuperVisor suffers from a complex and somewhat convoluted user interface. There are more menus than seem necessary, and you have to click through several windows to accomplish most actions such as scans. In addition, many of the windows are modal, so you often have to close several windows before you can switch to the Finder or other applications under MultiFinder.

GraceLAN's interface is much better than Network SuperVisor's, but it still requires you to go through several steps to get to the detailed information. First you select zones to scan, next you select users, and only then can you double-click on a field to get more-specific information. Radar has the best interface of all the four products: It's simple and intuitive and requires few steps to get at information. Status•Mac is a more complex program than Radar, but it also has a good interface, with easy access to data. Status•Mac's Browse window gives you all the information about individual Macs that GraceLAN provides but requires fewer steps to access it.

Action at a Distance

All of these products have features that let you do more than just collect data. Both GraceLAN and Network SuperVisor let you synchronize the clock on a user's Mac with your own and update responder INITs over the network. Network SuperVisor

also lets you shut down and restart a Mac as well as take a snapshot of the user's screen — useful if you have to describe problems over the phone. GraceLAN and Network SuperVisor users can prevent the network administrator from accomplishing any of these tasks by using the control panel that's part of each product's responder INIT.

Radar includes features of several network utilities. Like Apple's Inter•Poll, it gives you a list of network sockets, useful for seeing what AppleTalk processes are running on the network. Radar also lets you update your printers (see Figure 5). It shows you the fonts in a printer's memory and hard disk and lets you move fonts between your Mac and the printer. You can also rename a printer. Network SuperVisor and GraceLAN can both see printers but not update them.

GraceLAN has some built-in network utilities too. One command runs test signals from your Mac to another and reports the average response time and error



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Any of these programs is an improvement over the old method of gathering information by running around your office, opening up Macs, and annoying your colleagues.

count to check the network's physical connections. The Topology window displays a logical diagram of the structure of your network, which can be handy for troubleshooting (see Figure 6). GraceLAN is also the only program that can collect information from DOS machines as well as Macs on AppleTalk — useful if you have a mixed Mac/PC network. DOS users have to install a TSR (terminate and stay resident) program, the equivalent of a Mac INIT.

Although Status•Mac doesn't have any specific troubleshooting options, it does give you a lot of flexibility when gathering information. Its peer-to-peer store-and-forward architecture can scan Macs connected remotely to the network via a modem. It can also scan Macs that are not connected to a network — users can initiate a scan of their Mac from the control panel and pass the resulting file to the administrator on a floppy disk. At press time, Pharos was planning to add a separate application, called Personal Status, to Status•Mac that would let users scan their own Macs and view the data.

The one feature that none of these products yet offer is the ability to act on the information gathered — by updating applications or INITs, for example. However, products already exist that do this exclusively (see the "Instant Updates" sidebar), and future versions of Radar and GraceLAN should be able to update across the network too.

The Bottom Line

The days of opening up all the Macs on a network to see what cards they hold are over — now you can buy network-management software to do it for you. The key points in looking for a package are how little it interrupts users; whether it has a solid, easy-to-use database manager for doing quick analyses; and how thoroughly it gathers data. Troubleshooting features

— such as the ability to list network devices — are useful but are usually available in other network utilities. See Table 1 for a comparison of the products' features.

Status•Mac 2.0, from Pharos Technologies, has overcome the weaknesses of its first version (which required a dedicated mail server or file server to send messages) and now offers the best features. Its quick scans and well-thought-out Profile Request minimize annoyance to both the scannee and the scanner. Its peer-to-peer store-and-forward architecture guarantees that every Mac will eventually be scanned, regardless of when it is turned on. You can even scan Macs that are not on the network. Status•Mac's database manager works well, and its bundled templates bring all kinds of cross-related data to your fingertips. In addition, the bundled System 7.0 Readiness Kit greatly enhances Apple's Group Upgrade Kit by allowing you to see the System 7-upgrade needs of Macs across a network.

If you also need to scan PCs on your network, GraceLAN 2.0, from Technology Works, is your only choice at this time. Its topological diagram of the network is useful for troubleshooting network problems. Although GraceLAN doesn't have a built-in database manager, its ability to export information directly to databases is helpful.





On the low-cost scale, Radar 1.0, from Sonic Systems, is a real bargain for large networks. At \$499 for unlimited users, it costs less than half as much as its competitors. Radar sports a very intuitive interface, and it's the only product that lets you upload fonts to and download them from a printer. It also does very fast scans. Unfortunately, Radar doesn't include applications in its scans, and the only way to export gathered information to a database is indirectly, through reports saved as text.

At press time, CGS Technologies' Network SuperVisor 1.0.6 was the oldest program of the group, and its age shows. Although it's built around a powerful database manager with good sorting and reporting capabilities, Network SuperVisor is marred by a cluttered interface and slow scanning.

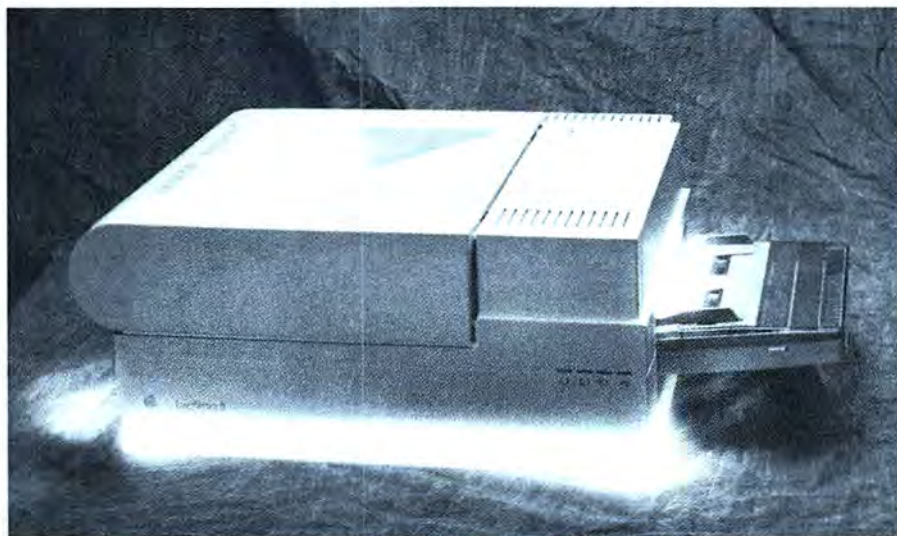
These programs are an improvement over the old method of gathering network information by running around your office and opening up Macs. Now *that's* the way to annoy your colleagues. ☞

John Rizzo, MacUser's technical editor, is a former network manager.

Table 1: Features of Network-Management Software

				
	GraceLAN 2.0	Network SuperVisor 1.0.6	Radar 1.0	Status•Mac 2.0
	● = yes ○ = no			
List price	50 users, \$495 200+ users, \$1,195	25 users, \$495 50 users, \$795 75 users, \$995 unlimited users, \$1,295	unlimited users, \$499	25 users, \$449 unlimited users, \$1,199
Pros	Scans DOS PCs. Draws network diagram.	Beefy database manager with sophisticated analysis capabilities.	Fast scans, good interface. Built-in printer utility.	Thorough, fast scans. Flexible scan scheduling. Good interface.
Cons	No database manager.	Slow scans. Complex interface.	No database manager. Doesn't scan for applications.	Takes over user's Mac when scanning.
Features				
Database manager	○	●	○	●
Uses ADSP	○	○	●	●
User-controlled scans	○	○	○	●
Message capabilities	●	●	○	●
Sees routers	●	●	○	○
Sees printers	●	●	●	○
Uploads/downloads printer fonts	○	○	●	○
Scans PCs	●	○	○	○
Balloon help	●	○	○	●
Information scanned				
CPU	●	●	●	●
Memory	●	●	●	●
Monitors, NuBus boards	●	●	●	●
SCSI/hard drives	●	●	●	●
System software	●	●	●	●
Control panels, rdevs, INITs	●	●	●	●
Fonts, DAs	●	●	●	●
Applications	●	●	○	●
Company	Technology Works 4030 Braker Lane W. Ste. 350 Austin, TX 78759 (800) 688-7466 (512) 794-8533	CGS Technologies 530 William Penn Pl. Ste. 329 Pittsburgh, PA 15219 (412) 471-7170	Sonic Systems 21211 Rainbow Dr. Cupertino, CA 95014 (408) 725-1400	Pharos Technologies 4243 Hunt Rd. Cincinnati, OH 45242 (800) 548-8871 (513) 984-9273

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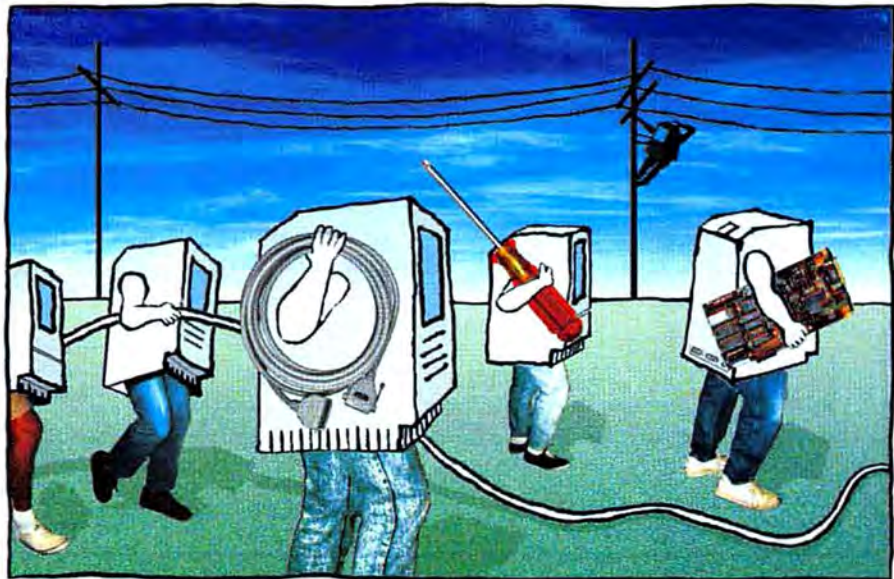
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Physical Fitness

Electronic troubleshooting tools are all the rage, but to keep your network in peak condition, you'll still have to burn some sneaker tread.

By Kurt VanderSluis



In the olden days of networking (a year or two ago), troubleshooting was a fairly physical job. In addition to checking the software and hardware configurations on devices all over the network, most of us spent lots of time trying to locate network troubles by crawling under desks, tracing wires in phone closets, and climbing into ceiling crawl spaces. Today, electronic tools such as network-management programs let us gather detailed information about a network without leaving our desk (see "Maximum Mac Management," elsewhere in the Bridges section). The troubleshooting tools in this new generation are so proficient, in fact, that they may lull you into a false sense of complacency, tempting you to do all your network diagnostics from a seated position.

Don't do it! High-tech tools are extremely useful, but they'll never completely replace the low-tech, physical aspects of troubleshooting. Electronic troubleshooting tools are designed to find specific problems, so if your network troubles fit the preprogrammed scenarios, you'll be in luck. But if your problem falls outside the programs' scope, you'll still have to revert to traditional troubleshooting procedures such as crawling under desks looking at cable connections.

One important low-tech technique that can't be replaced is component swapping, or replacing the pieces of your network setup one at a time until you locate the trouble spot. Not long ago, component swapping helped me

locate a problem that couldn't be detected by any of the electronic tools I had available. This incident illustrates the importance of combining high-tech tools with a low-tech physical approach.

The Network Setup

The problem I was experiencing — no network zones — occurred when I was setting up a test to look at recovery mechanisms in routers. Some Ethernet routers are intelligent enough to recover from certain kinds of configuration errors, and I wanted to see what sorts of misconfigurations the routers could (and could not) handle.

I built a simple Ethernet network that consisted of a Mac IIx connected to a Shiva FastPath router through a Farallon StarController EN (see Figure 1). The StarController is a multiport repeater — also called an Ethernet hub — that creates an Ethernet network in a star configuration. If you use a LocalTalk hub, note that an Ethernet hub is similar in concept, the major difference being that it requires two pairs of wires for the network signal — one pair to transmit and one pair to receive. The StarController also uses 10BASE-T Ethernet; 10BASE-T is an Ethernet standard that specifies how to build Ethernet networks using unshielded twisted-pair wire (popularly known as telephone wire) and RJ-45 ports (which are like phone jacks).

Unfortunately, neither the Ethernet card in my Mac nor the FastPath router supports

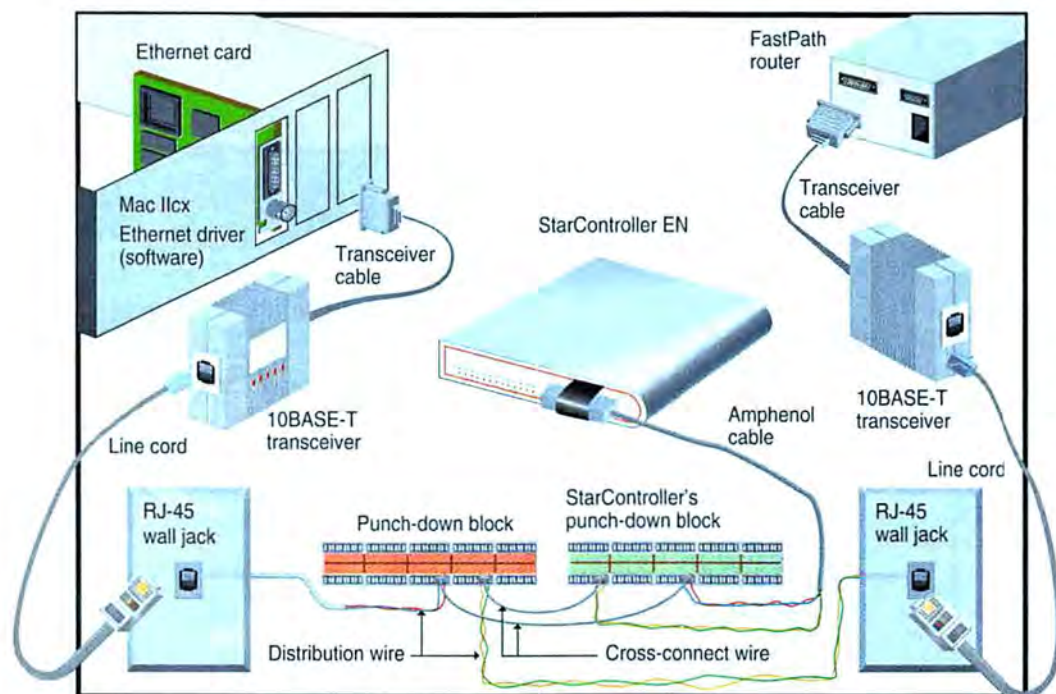


Figure 1: This basic 10BASE-T Ethernet network consists of a Mac IIcx connected to a Shiva FastPath router through a Farallon StarController EN. Because neither the Mac's Ethernet card nor the FastPath router supports 10BASE-T, each is connected to the network through a 10BASE-T transceiver (the Farallon StarConnector EN), which provides an RJ-45 port for the twisted-pair wire used throughout the network.

10BASE-T. Instead, they provide ports for two older Ethernet standards: thick coaxial wire (AUI port) and thin coaxial (BNC port). To make the two devices compatible with a 10BASE-T Ethernet network using twisted-pair wire, I connected the AUI port of each device to a Farallon StarConnector EN, an external transceiver that provides the electrical interface for 10BASE-T, including an RJ-45 port.

Like most 10BASE-T transceivers, the StarConnector has several lights that relay information about the status of the network connection. These include a power light, a link-status light that shows that the transceiver is communicating with the StarController hub, and three other lights that indicate when the Mac (or router) sends or receives a data packet or experiences a collision (sending or receiving data over the network simultaneously with another device). Likewise, each of the StarController's 12 ports has lights for power, link status, and incoming traffic (packets received). (For more on 10BASE-T choices and configurations, see "Instant Ethernet: 10BASE-T," September '91, page 174.)

After setting up the Mac and making sure its Ethernet card and transceiver were working, I set up the FastPath router and configured it to be a Phase 2 router with extended Ethernet addressing. That is, I

assigned a range of network numbers and a list of zone names to the Ethernet port, instead of the one network number and one zone name used by a nonextended network such as LocalTalk or AppleTalk Phase 1.

Once the Mac and the FastPath were both ready for action, I plugged the transceivers in to their respective RJ-45 wall outlets and went to the telephone closet (the nerve center of the network, where all the wires meet) to make the corresponding connections on the punch-down blocks. Finally, the entire Ethernet network was in place — Mac, router, transceivers, StarController, wiring — so I turned the FastPath on and let it go through its startup routine. I could tell when the FastPath was ready, because the transmit light on its transceiver began blinking every ten seconds — like all AppleTalk routers, the FastPath is required to broadcast routing information (called RTMP packets) every ten seconds.

I then turned on the Mac and selected the Phase 2 Ethernet driver from the Network control panel. I opened the Chooser window. I closed the Chooser and repeated the selection process — still no zones. Obviously, the Mac was not communicating with the FastPath; otherwise, I would have seen the zone list I entered when I configured the router.

Electronic Inspection

OK, what was wrong? I first checked all the obvious things. The transceiver cables were plugged all the way in, and the power and link-status lights on both transceivers were lit. All the network wiring connections were solidly in place, and I double-checked in the phone closet to make sure the wires were cross-connected correctly in their punch-down blocks. The jumper setting on the Mac's Ethernet card was correctly set for the AUI port, as was the selector switch on the FastPath.

The Mac's transceiver periodically blinked its transmit light, which I could relate to all the normal stuff that happens when a Mac boots up on Ethernet: transmitting node-address data; registering sockets for network applications such as Timbuktu, DataClub, and electronic mail; and so on. The same was true for the FastPath — the transmit light on its transceiver blinked every ten seconds, indicating that the router was sending out RTMP packets on schedule. The blinking of the traffic lights on the StarController matched that of the transceivers. Clearly, the two Ethernet devices were sending and the StarController was receiving. This proved that the network had both electrical continuity and Ethernet-link continuity.

I ran diagnostic tests on the Ethernet card, and all of its functions checked out perfectly, with one exception — it wasn't



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receiving any data packets from the network. I let the test continue for 30 seconds, and still it received no packets. This was strange: The electrical circuit was complete and the router could send packets, but the Mac wasn't receiving them.

I reinstalled the Ethernet driver on the

Mac, making sure that it was the correct one for the card. Still no luck. Then I ran the AG Group's EtherPeek, a network-monitoring program that uses its own Ethernet drivers instead of those installed in the Mac. If EtherPeek could receive a packet, then I would suspect that my

Ethernet drivers were conflicting with the System software. But EtherPeek didn't receive any packets either, although the FastPath was still sending them out. In desperation, I changed the configuration on the FastPath so that it routed both Phase 1 and Phase 2 Ethernet — just in case there was a software-configuration problem. Still no packets, still no zones.

Next, I used Farallon's StarCommand 2.2.1 software to check the integrity of the StarController and see whether data was moving through it. The StarCommand statistics showed that the StarController had received several packets each from ports 1 (the Mac) and 2 (the FastPath) with virtually no errors. Now I was really confused: Everything was connected, both the Mac and the FastPath were sending valid packets, and the router was receiving packets just fine — but it was a one-way connection, because the Mac couldn't receive data from the router.

Getting Physical

None of my high-tech tools could locate the problem, so it was time for some manual labor. I swapped Ethernet cards, transceivers, twisted-pair line cord, and the Amphenol cable that connected the StarController to the punch-down block. I moved the Mac and the router to different ports on the StarController, but nothing helped. There was only one thing left to swap out — the StarController itself.

I didn't have a spare StarController, so I decided to get rid of the 10BASE-T network setup altogether — transceivers, twisted-pair wiring, wall jacks, punch-down blocks, the works — and directly wire the FastPath to the Mac's Ethernet card. I ran a piece of thin coaxial wire from the FastPath's BNC port (and changed the port-selector switch setting) to the Ethernet card's BNC port. I changed the card's jumper setting from the MAC to the BNC port and switched the Mac back on. Lo and behold, everything worked! The Mac could receive packets, I could see zones in the Chooser, I could print through the FastPath to a LaserWriter, I could see the RTMP packets with EtherPeek. I concluded that there must be something wrong with the StarController itself.

I called Farallon's tech support and told them my story. The technician agreed with my diagnosis and sent me a new StarController. When it arrived, I changed the network back to its original setup and installed the new StarController — and the packets (and zones) disappeared all

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TROUBLE SHOTS

over again, although everything still seemed to be working fine. It wasn't the StarController after all.

I decided to swap the only things left — the wall outlets where I connect the line cords. I didn't really suspect that the wall plates were a problem, but I'd tried everything else. Much to my surprise, however, when I replaced the wall plate where the FastPath was connected, my 10BASE-T Ethernet network was finally operational, with all devices talking to each other and zones showing up in the Chooser.


Looking more closely at the errant wall plate, I found the reason for my network headaches: When I wired the wall plate a few months earlier, I had mistakenly reversed the polarity on the transmit pair of wires. Because I'd never used that wall plate before, I hadn't discovered the problem. All the tools I used to check it during installation — an ohmmeter to measure the line resistance, a TDR (time-domain reflectometer) to measure the impedance characteristics, a tone test to trace the distribution wires back through the wall to the phone closet — showed that the wall plate was fully functional. None of these tests detected the crossed polarity.

When I tried to establish the Ethernet network, my network-diagnosis tools also failed to pinpoint this fatal flaw. The FastPath was sending out valid packets, but the reversed polarity in the wall plate's transmit wires turned the packets into electronic gibberish, rendering them unreadable to the Mac. The blinking lights on the StarController and transceivers indicated that they were sending and receiving, because they show only electrical pulses, not necessarily the presence of packets. Likewise, the StarCommand statistics reported a normal network, because reversed polarity is not one of the errors the program can detect. (More-expensive Ethernet hubs, such as those made by Cabletron and Synoptics, can detect polarity errors; you can also buy hand-held wiring testers for around \$100 that detect this problem.)

In short, my high-tech troubleshooting tools failed to detect a very simple problem, and I was able to locate the trouble spot only by using a low-tech approach, component swapping. And although component swapping located the problem, it was an even lower-tech procedure, visual inspection, that identified the cause.

I have a healthy supply of electronic tools in my troubleshooting arsenal, but the moral of this story is not that we need

more tools but rather that we must understand the limitations of these tools and be prepared to go back to basic troubleshooting techniques. Now that I know that StarCommand can't check for correct polarity, I won't interpret "error-free" packets as a sign that the polarity is correct.

Likewise, I'll remember that low-tech procedures such as component swapping are still important, no matter how fancy the electronic tools become. 

Kurt VanderSluis is president of The Network Group, a training and consulting firm in Seattle.

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Size: 419K
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Line Screen: 150 lpi
Gamma Correction:
None



Microtek Scan

Original:
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Brightness level:
default
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Size: 1201K
Output Resolution:
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Line Screen: 150 lpi
Color Correction:
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Silverscanner

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Line Screen: 150 lpi
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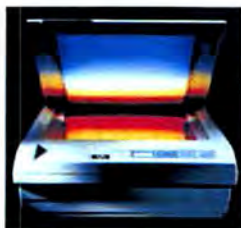
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POWER TOOLS

Afraid your Mac SE/30, IIfx, or II is obsolete because you can't break the 8-megabyte memory barrier? Connectix has a solution — MODE32, a \$169 software ROM patch that turns older 68020 and 68030 Macs running System 7 into lean, clean, 32-bit machines, giving them access to up to a gigabyte of memory and the speed of 32-bit programs. (800) 950-5880.


By John Rizzo

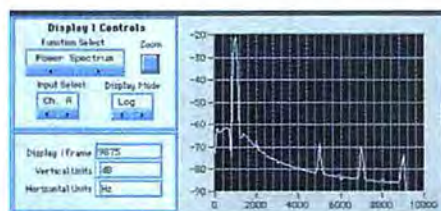
Key technologies: Ever wish the 15 function keys on the Mac's Extended Keyboard were the same for all applications? Apple has standardized F1 through F4 in System 7 as Undo, Cut, Copy, and Paste; now Go Technologies, maker of Hot Keys keyboard macros, wants Apple and other software manufacturers to standardize the rest. According to Go's plans, F5 and F6 would define type specs and tab settings; F11 through F15 would activate Find, Select All, Print, Save, and Open; and F7 through F10 would be left to the user's discretion. * CE Software's QuickKeys 2 (\$149) now supports Apple events under System 7. So? Well, for example, with a single keystroke, you can grab data from your database, plot it in a spreadsheet, and import the chart into your word-processing program. (800) 523-7638.



Hot fusion: For those who find the IIfx too slow, Fusion Data Systems — maker of the TokaMac 68040 accelerator cards for the LC, IIsi, SE/30, and IIfx — should have a 68040 IIfx accelerator soon. The board features a screaming 33-megahertz 68040 processor, with connectors for the IIfx's NuBus slot as well as the faster PDS (processor-direct slot). (512) 338-5326. * For the rest of us, Fusion plans to offer a new TokaMac card for the LC for less than \$2,000. The new board will use a cheaper 68040 chip, which has no built-in floating-point coprocessor (used by applications such as spreadsheet programs) or paged-memory-management units (needed if you want to use virtual memory). Still, it promises a significant speed improvement over a stock LC or even a IIfx.

Programming news: Need to create stand-alone HyperCard stacks for users who don't have HyperCard? StackRunner (\$99), from Symmetry Software, installs run-time engines in HyperCard stacks, increasing stack size by a mere 150K to 200K. (800) 624-2485. * With its Think Reference CD, Symantec brings *Inside Macintosh* inside Think C and Pascal. This on-line tool lets you search for IM info from within C and copy toolbox calls directly into your own program. A steal at \$99. (408) 253-9600.

Sound advice: While most of us are still figuring out what to do with the microphone on the new Macs, audio professionals can now use their Mac to analyze telecom signals and measure noise levels. National Instruments turns the Mac into a low-cost (around \$8,000) spectrum analyzer for taking a closer look at audio with a hardware/software package called the Audio Frequency Fourier Analyzer. It includes DSP (digital signal processor) and input cards as well as modules for LabVIEW software. (800) 433-3488. 



The Best Backup Strategies

Backing up isn't hard to do, and with the right tools, it can be virtually painless. Here's a guide to where to do it, when to do it, and how to keep your backed-up files safe.

By Laura Brown

Nobody ever said that backing up your data was fun. It's a tedious chore that people tend to put off if it takes a lot of time. But backing up regularly is crucial — fire, floods, earthquakes, and other natural disasters can wipe out your data, as can more-mundane events such as power cuts and plain old human error. You can ease the time spent and the tedium of backing up by choosing a storage medium that's large enough to accommodate the data in one unit, scheduling backups so they cause the least inconvenience, and storing the backups in a safe place.

Before you decide which medium to use for backing up, look at your data. If you have a 20-megabyte hard-disk drive with applications that seldom change and a couple of dozen word-processed text files, you can probably easily back up those files onto floppy disks. On the other hand, if you're doing a daily backup of a 300-megabyte file server, floppy-disk storage would involve hundreds of disks and a huge amount of time — backing up to DAT (digital audiotape) would probably be more practical.

Here's a description of the most common storage media. For details on how much data these media can hold and how much they cost, see Table 1.

Floppy Disk. This is certainly the least expensive solution, because you're bound to have a floppy drive, but as mentioned earlier, your storage needs should be modest. If you're not going to use software specifically designed for backup (such as Redux or FastBack II), compress the files first with a program such as DiskDoubler, StuffIt Deluxe, or Compactor. Choose a program that can write large files across more than one floppy.

Tape. This is a convenient and often very economical medium for backing up large amounts of data (see "Getting It on Tape," December '89, page 189). Depending on how many megabytes you're backing up, you can choose from several types of tape: 8-millimeter videotape; DAT (see "Less Is More: Digital Audiotape" elsewhere in this issue); DC 600 and DC 2000 cartridges; and data cassettes, such as Teac 60 and Teac 150 cassettes.

Removable Cartridges. This category includes everything from removable magnetic drives (SyQuest, Bernoulli) to erasable optical drives. In an emergency, you can re-create the contents of your hard disk if you've done a complete backup.

Mirroring and Duplexing Systems. If you need data protection that is absolutely current,

mirroring and duplexing systems (such as Golden Triangle's Disk Twin) let you write data to two hard disks at once. Then if one hard disk fails, you can use the second disk, which will contain identical data. This is *not* a substitute for backing up, however, because the second disk is written to immediately and there is no previous version of the disk to go back to, you're not protected if you mistakenly trash an important file or if a virus infects your system.

Backup Frequency

How often you back up is determined by how often your data changes. Which files change daily, weekly, monthly, or more frequently? How serious would it be if you lost any of the data? Make a tentative schedule, and then imagine worst-case scenarios to see if you can live with the schedule you've mapped out. Figure out which files almost never change (applications and fonts, for example). You may want to back up these files less frequently.

The backup software you use will determine how much you can automate the procedure. Most programs let you write scripts for different sessions that specify what you want to copy in any given backup. Many also let you specify the time and date when you want the backup performed. Popular programs include Retrospect (Dantz), DiskFit (SuperMac), FastBack II (Fifth Generation Systems), and Redux (Microseeds). (If you're backing up a network, see "Overnight Success: Network Backup," August '91, page 112, for software suggestions.)

Backup Strategies

Once you've determined what needs to be backed up and how often you need to do it, you can choose one of the following two basic backup strategies:

Incremental Backup. This method requires you to back up every file occasionally (say, once a week), but most days you copy only those files that have changed since the last full backup. This approach saves time and storage space, but with some backup programs, there is a price to pay — to restore your data, you must first load the full backup and then load each incremental version up to the present. And if one of the tapes, disks, or cartridges you are restoring from is defective, you will have lost some of your data.

Full Backups. This method requires that

Table 1: Storage Media — Capacity and Cost

	Capacity	Media cost*	Drive cost*	Comments
Floppy disk	800K (double-density), 1.4 MB (high-density)	\$12 – \$20 per ten-disk pack	NA	Best for backing up occasional files or hard-disk drives with fewer than 20 megabytes.
Tape				
8-millimeter video	2.2 GB	\$10 – \$75	\$4,000 – \$7,500	Can use inexpensive consumer-grade videocassettes. Good for network or file-server backups.
DAT	1.3 GB	\$18 – \$25	\$1,500 – \$5,000	Good for very large hard-disk-drive, network, or file-server backup.
DC 600	150 – 525 MB	\$150 per two-cassette pack	\$1,000 – \$3,500	Good for backing up large personal hard-disk drives.
DC 2000	40 – 120 MB	\$16	\$1,000 – \$1,500	Slow. Good for personal backup.
Data cassette	60 – 150 MB	\$15 – \$22	\$800 – \$1,500	Good for small single-user hard drives. Look like audiocassettes.
Removable magnetic disk	40 MB	\$60 – \$80	\$400 – \$1,100	Cartridges very delicate; shouldn't be used as primary backup medium.
Erasable optical disc	up to 1 GB	\$160 – \$250	\$2,800 – \$8,000	Expensive but has long shelf life.
Mirroring/duplexing	Second hard-disk drive required.	NA	Depends on hard-disk size.	For up-to-the-minute data protection. Should be used in addition to normal backups.

*All prices are approximate.

you back up every file each time. This takes longer and requires more storage space than do incremental backups. If you have enough storage space and software that can run automatically when demands on the server are low, the safest bet for a busy server is to do full backups daily.

Generational Backups

No matter how religiously you back up, if you have only one copy of your backed-up files and there's something wrong with that copy, you're out of luck should you need to restore the data. Doing generational backups overcomes this problem. With this strategy, you keep the last three full backups so that you always have access to the last three generations of your data.

Here's how to set up a generational backup schedule. Say you're doing nightly full backups onto DAT cartridges. To do generational backups, you'd need to start a log book with columns for tapes labeled A, B, and C. The first night, take a new tape, label it A, and do your backup. Put the date and your name under column A in the log book. The second night use another new tape, labeled B, copy your data, and enter your name and the date in the B column. The third night, label another tape C and repeat the process.

You now have three complete backups that represent the last three versions of your data. The oldest backup, tape A, is

the grandparent, B is the parent, and C is the child. On day 4, reuse tape A and make a note in the log that A is now the most recent version, or the child (B is now the grandparent and C the parent). Continue rotating the tapes, backing up to the grandparent cartridge every night and recording the details.

When you need to restore data, use the most recent version. If that tape is defective or if the data is corrupted, you'll have two previous versions to fall back on.

Archives and Storage

If your data isn't stored in a safe place, it's not going to do you much good. At least one copy of your data should always be stored off-site, preferably in a fire-safe compartment. If you're rotating tapes, using generational backup, the grandparent of the day should be carted away and yesterday's grandparent (today's child) should be brought back on-site. If you've chosen to make two copies of each backup, one copy should be stored elsewhere.

Most of us have data on our disks that isn't used on a day-to-day basis but will be needed in the future — for example, a quarterly tax form. Not only does this data take up valuable space on disk but also backing it up over and over wastes both time and storage space. The best way to deal with such files is to put them in storage (also known as an *archive*). Make

two copies of the data on separate tapes or disks at separate times. Store one copy off-site. Once you've made your copies, delete the files from your hard disk.

Label the media carefully with the date (including the year) and what files they contain. Your backup software should allow you to print a list of the filenames on the archive. Keep a log with the names and dates of your archives and a listing of the files in each one. Keep a list with your off-site copy as well.

Name files so their content is obvious. Good filenames may include the client or project name, the time period covered, and some description of the file.

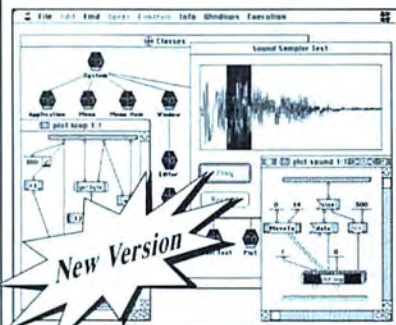
Backup Plans

Backing up is one of those procedures in which the only route to success is a slavish adherence to the plan. Devise a workable strategy, streamline the procedures as much as possible, and then follow your plan like a zealot.

- Allow for absences and vacations by training several people in the procedures.
- Clearly label backup media, archives, and logs, and keep them in a designated place.
- Establish a routine for getting the storage media off-site.

Laura Brown is a San Francisco-based free-lance writer and consultant.

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The Organized Mac

Use System 7's tools to organize your hard disk, and even if the rest of your life is a mess, at least the disk will be in good shape.

By Bob LeVitus



One of the nicest things about the Mac's interface is that it doesn't force a particular organizational style on users. You can — for the most part — put any file into any folder. The problem with this freedom is that files can be hard to find if you don't have some kind of structure or plan. System 7 provides several tools to help you keep your Mac organized, including labels, aliases, the Apple Menu Items folder, and the Finder's new Find function. By combining the power of these tools, you can organize your hard disk better than ever before. This month we'll examine several ways to organize your files and folders, methods of finding them after you've put them away, and third-party tools that make getting (and staying) organized easier.

There's a Place for It

System 7's cool tools won't help you a bit if you don't begin with a good foundation — a folder structure designed to help you find things quickly and easily. Ask yourself if your current folder structure lets you find a file quickly. If it doesn't, consider implementing a different structure.

Some people prefer a set of folders based on the type of document — a separate folder for correspondence, memos, spreadsheets, and so on. Others like having an individual folder for each client or job. Another common structure is to save files in folders based on their creation date: an October '91 folder, a November '91 folder, and so on. Some users assign folders based on applications: a Word-files folder, a

MacDraw-files folder, and so on. Many people like to keep their applications in a single folder.

Whatever system you use, set it up in advance. Most Save and Save As dialog boxes don't let you create a new folder, so if the proper folder doesn't exist when you save a file for the first time, you have to backtrack through several time-consuming steps (go to the Finder, create a folder, find the proper place for it, and drag the file into the folder or return to the application and save the file into the folder).

Folders are only one part of organizing your Mac, however. If you're like most people, there's probably a lot of deadweight on your hard disk — duplicated files, seldom used applications and utilities, outdated Preferences or Default files, and so on. Spend some time weeding out your hard disk, trash the files you don't need, and move archival material (backups and duplicates) to floppy disks, backup tapes, or removable cartridges. Take a look at what's left on your hard disk. If you have a lot of programs and documents that you want to keep accessible but use only occasionally, consider partitioning your hard disk with a program such as FWB's Hard Disk Partition. You can set up a partition for files you use regularly and another for the ones you use once in a while.

Aliases and the Apple Menu

Aliases are one of System 7's best organizational features. Let's say you create a memo to the marketing department about Joe Client. Do you store it in the Memo folder, the Marketing

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folder, or the Joe Client folder? With aliases you don't have to decide — simply store the actual file wherever you like, and put aliases into the other folders. Then, no matter which of the folders you look in, you'll be able to find and open the memo.

Creating aliases is easy: Select the file that needs the alias, go to the Finder's File menu, and choose Make Alias. Then you can move the alias to the desired location. Although this is easy, it's not exactly a one-step procedure. To streamline alias creation, *MacUser* has developed the *Nom de Plume* utility, which lets you create, name, and place aliases in one step (see the "System 7 File" sidebar for details).

There are many ways to use aliases. Here are some of my favorites:

- Keep aliases of frequently used files and folders on the desktop or in the Apple Menu Items folder (or in both places — aliases consume only 3K each). I keep aliases of folders on my desktop that pertain to projects I'm currently working on as well as aliases for my contacts database and my to-do list. Although the actual folders and files are buried three or four levels deep, I use the desktop aliases to get at them with a double-click. Items on the desktop are also easy to find when you're in an Open or Save dialog box — simply click on the Desktop button or type Command-D.

- Keep an alias of the Apple Menu Items folder somewhere convenient such as on the desktop or inside the Apple Menu Items folder itself. This lets you add files and folders to the Apple menu by putting them into the folder. Conversely, you can weed out the folder without having to wade through the System Folder to find it.

- Keep an alias of the Apple Menu Items Folder in the Startup Items folder so that it opens automatically at startup. This gives you two ways to access items that are on the Apple menu: You can use the mouse to choose them directly from the Apple menu, or you can use either the mouse or keyboard commands to select them in the Apple Menu Items folder.

- Because System 7 lets you launch files by dragging them over an application's icon (or an alias of an application's icon), keep aliases of frequently used applications on the desktop. That's where I keep my graphics program (Canvas), because it lets me open several file types even if they weren't saved in Canvas. Now I can open a paint, PICT, TIFF, MacDraw, or EPS file by dragging it over the application's icon. Back in the pre-System 7 days, I had

to launch the program first and then use the Open command to access the file.

- If you're on a network and frequently access an AppleShare volume or a shared folder on another Mac, make an alias of that volume or folder. Whenever you need to access that volume or folder, all you have to do is double-click on its alias — you don't have to go to the Chooser first to mount it.

Finally, a Finder That Finds

Despite all your careful planning and aliasing, eventually you won't be able to find a file. In the old days, searching for a file by any attribute other than its name required a utility such as DiskTop or DiskTools, but now your faithful System software has an excellent built-in Find function that can bail you out in a jiffy.

To invoke the Find function, choose Find from the File menu or use the keyboard shortcut, Command-F. To find a file by its name, simply type the name in the dialog box and click on the Find button.

But wait — there's more. By clicking on the More Choices button in the Find dialog box, you can find a file by size, kind, label, creation date, modification date, version number, comments in the Get Info box, or locked or unlocked status. You can search all disks or limit your search to a specific disk, selected folders, or just the desktop. You can search for files one at a time or have the Finder display all found files at once.

The Find function also lets you perform multiple-criteria searches. For example, to find all the filenames that contain the word *doc*; are smaller than 10K; and were created after June 4, 1991, all you have to do is press Command-F and click on the More Choices button. Choose the volume you want to search from the Search pop-up menu, check the All at Once box, and click on OK. When the search is complete, and without clicking in the window containing the found items, choose Size from the Find pop-up menu, choose Is Less Than from the Criteria pop-up menu, and type 10 in the size field. Choose The Selected Items from the Search pop-up menu, and click on OK.

When *this* search is complete and without clicking in the window containing the found items, choose Date Created from the Find pop-up menu, choose Is After from the Criteria pop-up menu, and set the date to 4/4/91. Choose The Selected Items from the Search pop-up menu, and click on OK.

The System 7 File: Aliases Anonymous

You don't have to be a rocket scientist to create aliases. You do, however, have to go through a few steps to create an alias and then put it where you want it. Wouldn't it be nice to have a one-step method of creating an alias and placing it anywhere on your hard disk? Well, *MacUser* has just the thing for you — it's *Nom de Plume*, developed exclusively for *MacUser* by Birmingham, Alabama, programmer Bill Monk, who also created *Alias Assassin* (see "The System 7 File: Alias Assassin," September '91, page 254). *Nom de Plume* is a utility that lets you create an alias of a file, folder, or disk and choose its location on the hard drive from within one dialog box. *Nom de Plume* makes it so easy to create aliases that you'll probably need *Alias Assassin* before too long to get rid of your excess aliases. Luckily, both of these utilities are available on *MacUser's* on-line service, *Zmac*, in Library 3 (Utilities) of the *MacUser* Forum. *Nom de Plume's* filename is *PLUME.SIT*. If you want to find *Alias Assassin*, its filename is *ALIASA.SIT*.

And now on to the System 7 tip of the

When the search is complete, all the files that meet all your search criteria are selected. The only limitation is that multiple-criteria searches can be performed on only one volume at a time.

Once you've gotten the hang of this technique, it's almost impossible to lose files — if it's somewhere on your hard disk, you'll find it easily.

For a Few Dollars More

System 7 provides excellent tools for getting (and staying) organized, but it doesn't give you everything. One feature I would like to see is hierarchical menus, which let you access files from within folders on the Apple menu without making you open the folder first. Fortunately, there are third-party products that give you this capability and a few others too.

One of my favorites is *Connectix's* *HandOff II*, which includes *SuperMenu* — hierarchical support for folders on the Apple menu. Two other nice features of *HandOff* are on-the-fly substitution, which lets you open documents even if you don't have their creating application, and automatic color-depth and sound-level switching. Do you, for example, have a game that requires your monitor to be set to 16 colors? No problem. Tell *HandOff*, and it switches your monitor to the 16-color mode when you launch the game.

Another product that has hierarchical

support for folders on the Apple menu is *NowMenus*, part of *Now Software's* *Now Utilities* package. *NowMenus* is more configurable than *HandOff II's* *SuperMenu* — you can choose which folders will be hierarchical, for example. *Now Utilities* also includes *SuperBoomerang*, a dialog-box enhancer that helps you find the file or folder you need when using an Open, Save, or Save As dialog box. It also lets you create new folders from within the Open, Save, and Save As dialog boxes.

Although the new Find command is useful, there will be times when you can't remember a filename but might remember some of the text within the file. For such situations, there's *GOfer*, from *Microlytics*, and *On Technologies' ON Location*, which can locate files quickly by searching for words within the file. *ON Location 2.0*, which should be available by the time you read this, will support Boolean searches and be fully compatible with System 7.

So there you have it: the fundamentals of using System 7 to organize your hard disk. Experiment with System 7's tools as well as with third-party products (including those you used with System 6) to find the right system for you. ☐

month, which was submitted via *Zmac* by Thomas J. Reestman. My regular readers know that I'm an advocate of rebuilding your Mac's desktop frequently: It helps your Mac keep track of data on your startup disks. So I naturally liked Tom's timesaving tip. He discovered that you don't have to reboot your computer in order to rebuild the desktop (which means that you don't have to sit around while all your INITs are loading). Instead, just quit all your applications, and press Command-Option-Escape while in the Finder. In the resulting dialog box, click on Force Quit, and then hold down Command-Option. The desktop will rebuild when the Finder restarts.

This saves quite a bit of time even if you don't use many INITs and can save a great deal of time if you have 20 or 30 of the little suckers, as I do.

Submit your favorite System 7 tips, either by mail or by modem in *Zmac's* System 7 Section. If you submit the month's best tip, you'll not only receive notoriety and fame but you'll also get a spiffy (and rare!) "I Beat the System" T-shirt.

Bob LeVitus has just finished updating *Dr. Macintosh* as well as *Son of Stupid Mac Tricks*, both published by Addison-Wesley (Reading, Massachusetts, 1991).

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Fri	09/21/90	07:00:46 PM	8:11	logged out
Fri	09/21/90	07:00:58 PM	8:11	logged in
Fri	09/21/90	07:01:11 PM	8:11	deactivated control panel
Fri	09/21/90	07:01:19 PM	8:11	added new user: Carol
Fri	09/21/90	07:01:32 PM	8:11	logged out
Fri	09/21/90	07:01:46 PM	8:11	logged in
Fri	09/21/90	04:02:06 PM	8:11	logged out
Fri	09/21/90	04:02:34 PM	8:11	logged in
Sat	09/22/90	04:03:07 PM	8:11	logged out
Sat	09/22/90	04:03:18 PM	8:11	logged in
Sat	09/22/90	07:03:36 PM	8:11	logged out
Sat	09/22/90	07:03:46 PM	8:11	logged in
Sat	09/22/90	02:01:02 PM	8:11	have logged out
Sat	09/22/90	02:01:12 PM	8:11	logged in
Sun	09/24/90	08:01:45 PM	8:11	logged out
Sun	09/24/90	08:02:01 PM	8:11	logged in
Sun	09/24/90	10:02:18 PM	8:11	logged out
Sun	09/24/90	10:02:23 PM	8:11	logged in

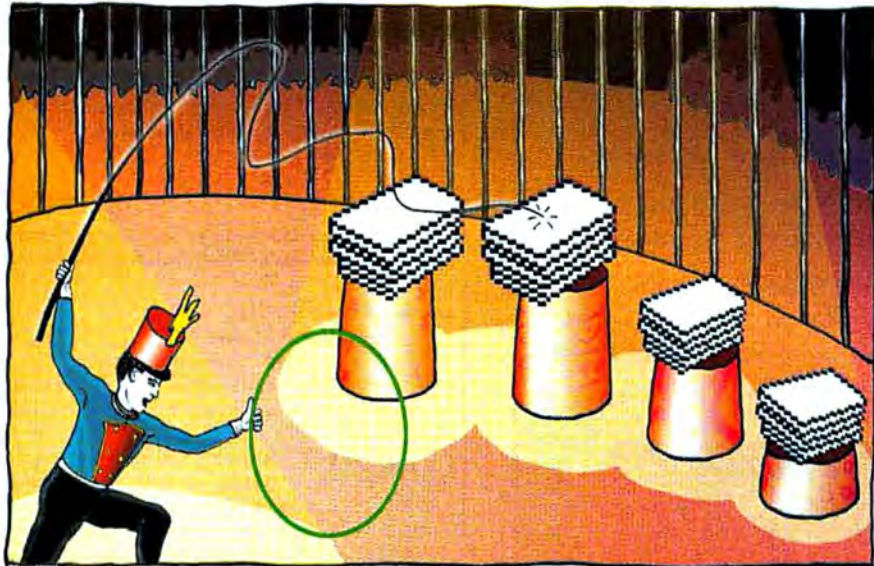
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Taming HyperCard Stacks

With all of HyperCard 2.0's new features, it's more important than ever to create well-behaved stacks — and to be prepared for those that aren't.

By Danny Goodman



In the old days of HyperCard, the very rare overlapping global variable was about as much conflict as one stack had with another. As a byproduct of the great new features added to HyperCard 2.0, however, stack conflicts can get out of hand. These new features let you create more-professional-looking applications with fewer XCMDs (external commands), but they also place a greater burden on authors. Stacks must cooperate with other open stacks as well as with stacks that use common resources at the same time.

Three primary elements — custom menus, shared code libraries, and multiple stack windows — play interrelated roles in such conflicts. I'll discuss the implications of each one and then tie all three together into a bare-essentials template (available from *MacUser's* on-line service, Zmac) that you can use as a model for your own scripts. Adopt the template as a starting point to make your stacks behave as good citizens on the streets of HyperCard City while they also accommodate stacks that don't adhere to the local customs.

Custom Menus

HyperCard lets you modify the menu bar in several ways. The simplest method is to add a new menu to the right of the existing HyperCard menus, as the HyperCard Home stack does. Other methods include adding items to an existing menu, modifying the contents of an existing menu, and even creating an entirely new menu bar.

Before your stack modifies a menu bar, it

needs to reset it, because the only menu bar you can be sure about prior to modification is the default HyperCard menu bar. To start with a pure HyperCard menu bar, insert the **reset menu bar** command before your menu-modification script.

If you fail to reset the menu bar before changing the menus, you run several risks. The most dangerous is that the menu bar in your stack may display custom menus left over from another stack. Choosing menu items from other stacks' menus can trigger script errors in your stack. Or if your stack attempts to modify a menu that was deleted by the previously opened stack, an error will appear — even though your scripts are fine.

Your stack should be well behaved when it's closed too. Whenever the user exits from the stack, your stack should reset the menu bar. In the case of a menu added to the standard HyperCard menus, you can achieve the same result faster simply by deleting your custom menu whenever the user leaves the stack. Unfortunately, there is a performance penalty for resetting the menu bar. On a Macintosh II, for example, it takes almost one second to restore HyperCard's menus.

Shared Scripts and Resources

Gone, thankfully, are the days when the only way to give related stacks common scripts and resources was either to install those items into the user's Home stack or to duplicate them in all stacks. In a multiple-stack environment (which I call a *stack system*), you can now

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temporarily insert a stack containing all the shared resources and scripts into the message hierarchy. Such a stack goes into the hierarchy right before the Home stack, and any stack you open can share the inserted stack's resources and stack script.

The command that accomplishes this message-hierarchy manipulation is **start using stack**, followed by the stack's name. To insert a stack named Preferences

into the message hierarchy, for instance, the command is **start using stack "Preferences"**.

The **start using stack** command does nothing more than insert the desired stack into the hierarchy. Resources contained in that stack (such as icons, sounds, and XCMDs) become instantly available to the current stack. But if you want to use any of the inserted stack's scripts, the

Example 1: Shared-Preferences-Stack Handlers

```
on setStartupInfo
    global saveLevel
    if saveLevel is empty then
        put the userLevel into saveLevel
        set userLevel to 5 -- or other desired setting
    end if
    if "Preferences" is not in the stacksInUse then
        start using stack "Preferences"
        if the result is not empty then
            answer "Sorry, cannot initialize properly." && -
                "Try quitting HyperCard and starting over."
            go back
            exit to HyperCard
        end if
    end if
    setGlobalMenus
end setStartupInfo

on setGlobalMenus
    -- Test first for presence of something unique about
    -- the custom menus. Here we'll look for our global
    -- menu called Preferences. If it's there, then we can
    -- bypass resetting and rebuilding our custom menus.
    if "Preferences" is not in the menus then
        set cursor to watch
        lock screen
        reset menubar -- start with clean slate
        delete menu "Go" -- don't want these HyperCard menus
        delete menu "Tools"
        delete menu "Objects"
        create menu "Preferences" -- our new menu
        -- finish putting menu items into Preferences menu
    end if
end setGlobalMenus

on cleanUp -- for use by other stacks
    global sameSystem, saveLevel
    if sameSystem is not true then -- leaving our system
        set cursor to watch
        set userLevel to saveLevel
        put empty into saveLevel
        lock screen
        reset menubar
        stop using stack "Preferences"
    end if
    put false into sameSystem
end cleanUp
```

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current stack must send messages to receive them. An inserted stack does not receive an **openStack** message just by being inserted into the hierarchy.

Removing a stack from the hierarchy requires the **stop using stack** command, as in **stop using stack "Preferences"**. At this point, the current stack immediately loses all shared resources. If, for example, the current stack

relies on icon resources in a shared stack, the instant you pull that stack from the hierarchy, the button icons will go blank.

You can add as many as ten stacks, although available memory or the number of open files (as determined by the operating system) will eventually determine how many you can insert at any one time. When you insert a stack, HyperCard also does some checking to make sure no more than

Example 2: Main-Stack Handlers

```
on openStack
  checkSetup
  setLocalMenu
  localStartup -- stack's local initializations
end openStack

on resumeStack
  checkSetup
  setLocalMenu
end resumeStack

on closeStack
  localCloseDown -- stack's local shutdown process
  removeLocalMenu
  -- call cleanUp only if shared stack is present
  if "Preferences" is in the stacksInUse then cleanUp
end closeStack

on suspendStack
  removeLocalMenu
  if "Preferences" is in the stacksInUse then cleanUp
end suspendStack

on checkSetup
  -- see if global menus are set and stack is in use
  if "Preferences" is not in the menus then
    if "Preferences" is not in the stacksInUse then
      start using stack "Preferences"
      if the result is not empty then
        answer "Sorry, cannot initialize properly." && -
          "Try quitting HyperCard and starting over."
        go Home
        exit to HyperCard
      end if
    end if
    setStartupInfo -- reinitialize system
  end if
end checkSetup

on setLocalMenu
  if "Main" is not in the menus then
    create menu "Main"
    -- rest of code to build "Main" menu
  end if
end setLocalMenu

on removeLocalMenu
  if "Main" is in the menus
    then delete menu "Main"
end removeLocalMenu
```

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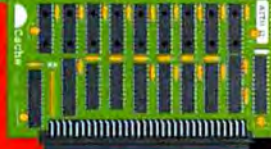
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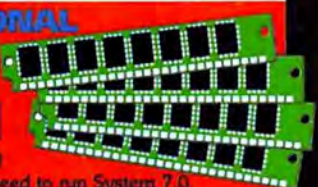


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An Alias by Any Other Name . . .

Aliases, which are part of System 7, create duplicate versions of files, folders, and volumes. What if you don't want to open folders on the desktop to create an alias? Nom de Plume is a utility that lets you create an alias and choose where you want to save it from within one dialog box. Nom de Plume was written by MacUser's alias expert, programmer Bill Monk, of Birmingham, Alabama. Nom de Plume is available exclusively on Zmac in the MacUser Forum, Library 3 (Utilities). The filename is PLUME.SIT.

How to Join Zmac

Here's how you can get access to Zmac:

- If you're a CompuServe (CIS) user, just type GO ZMAC at any ! prompt.

- If you're not a CIS subscriber, you can sign up for Zmac by following these directions:

1. Call (800) 635-6225 (voice) to find your local access number.

2. Set up your modem and telecommunications software with the following standard Mac settings: 8 bits, one stop, and no parity.

3. Dial your local access number. When connected, press Return. You'll see the following prompts on-screen. Your responses are printed in boldface type.

Host Name: CIS

User ID: 177000,5200

Password: Z*MAC

Agreement Number: Z12D9014

4. You will then be prompted for additional information, including a credit-card number for billing purposes. If you cannot bill to a credit card, call the CompuServe customer-support line listed below. Sign-up is free, but normal access time is billed at \$12.50 per hour.
5. Call CIS again with your user ID and password. A new password will arrive in the mail within ten days.

For more information, call CompuServe customer support at (800) 848-8990.

POWER TOOLS

POWER PROGRAMMING

one stack of the same name is inserted into the hierarchy. If, however, the hierarchy already contains ten stacks, **start using stack** will not shove one of the loaded ones aside to make room for yours.

Because memory and open-file limits can get in the way of inserting a stack into the hierarchy, it's important that your application know whether the **start using stack** command was successful. You should always test this by adding the **result** function after issuing the command. If the result is not empty (it probably contains the string "Can't start using that stack"), then the insertion was unsuccessful and your script should not proceed if it relies on resources or scripts from that inserted stack.

What error message you display to the user at this point is a tough call. It may not be enough to instruct the user to close other HyperCard stacks that are open at the same time. The user may have to actually relaunch HyperCard and open only your stacks.

There is something you can do, however, to make sure that your stacks don't cause problems for others — always remove your shared stacks from the hierarchy when your stack closes or when someone activates another stack in another window. Which brings us to the last of the Big Three potential conflicts.

Multiple Stack Windows

It used to be that when you opened a stack, you closed any other stack that was open at the time. Initializations (setting conditions and adding shared menus) were done when the stack opened, and menus were reset and shared stacks removed when it closed. With HyperCard 2.0, however, there is a world in between, in which a stack is neither fully open nor fully closed. Your stack enters this zombie state when the user activates a second (or third or fourth) stack in a separate window while your stack's window is still visible.

Your window's title bar is inactive, and the only thing HyperCard knows about your stack is that its window is open. At this point, your stack is suspended rather than being completely closed.

Here's what happens when a user suspends stack A by clicking in the window of stack B: HyperCard alerts stack A to its impending deactivation by sending a **suspendStack** message to the current card. A handler that intercepts this message can perform any cleanup activities (such as resetting the menu bar) before the stack takes a nap. This message is immediately followed by a **resumeStack** message, which HyperCard sends to the card visible in stack B's window the instant the stack awakens. By intercepting **resumeStack**, the handler in stack B can reinitialize whatever menus or shared stacks it needs.

Suspending and resuming a stack requires less initialization and cleanup than opening or closing a stack. When opening a stack, for example, you're setting global menus that apply to *all* the stacks; when resuming, a stack may be adding custom menus only for that one stack.

A Sample Stack System

Customized windows, shared scripts and resources, and multiple stack windows all play their part in conflicts among stacks. To show you how you can avoid such conflicts, I've created a template that ties all these threads together.

There are a couple of things you need to know about the three-stack system presented in the template. First, a shared stack, called Preferences, is inserted into the message hierarchy so that other stacks in the system can share that stack's resources and stack script. Second, the Preferences stack sets custom menus common to all stacks in the system. Each of the stacks, however, also has its *own* custom menu. In other words, the menu bar displays what I call *global menus* (ones that are shared by all stacks in the

Example 3: Button Leading to Another Stack

```
on mouseUp
  global sameSystem
  put true into sameSystem -- bypass flag for cleanUp
  go to stack "Help Stack" in a new window
  if the result is not empty -- not enough memory
  then go to stack "Help Stack" -- not in new window
end mouseUp
```

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POWER TOOLS POWER PROGRAMMING

system) and a *local menu* (one that's used by a single stack within the system).

The three stacks are Main, where most of the user activity takes place; Help, accessible by a click on a Help button; and Preferences, which is shared by the other two stacks but is never visible to the user.

Example 1 shows the framework for essential handlers in the shared Preferences stack. `setStartupInfo`, the first handler, initializes whatever global variables or other settings the visible stacks depend on. The first task it performs is to save the current `userLevel` property to a global variable so the original user level is restored when you leave the stack. Next, by examining the results of the `stacksInUse` function, it looks to see if this Preferences stack is part of the message hierarchy. This function presents a return-delimited list of pathnames to whatever stacks have been inserted into the hierarchy (that is, stacks in the hierarchy *other* than the current stack or Home). If the stack isn't in the hierarchy, the handler will insert it, checking the

It used to be that when you opened a stack, you closed any other stack that was open. With HyperCard 2.0, there's a world in between, in which a stack is neither fully open nor fully closed.

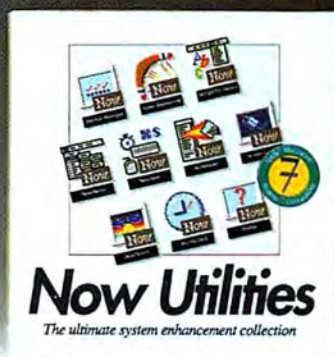
`result` function for a successful operation (as described earlier). Finally this handler calls another handler, `setGlobalMenus`, to set up the menu-bar elements shared by all the stacks of the system.

`setGlobalMenus` performs its menu-building job only if the job is necessary. It looks for a unique element in the system's menus (a menu name, for example) that indicates that global menus have already

been installed. When you use this template, you can even check for the existence of a particular item *within* a menu, in case your menu names are not unique.

The last handler, `cleanUp`, is called by the Main and Help stacks whenever those stacks are suspended or closed. Under strict script control (for example, when you have a button that leads from one stack to another within the system), you can set a value for a global variable, called `sameSystem`, that allows `cleanUp` to bypass rebuilding the menu bar and removing the Preferences stack from the message hierarchy. The more you can leave intact, the faster will be the shift from stack to stack within the stack system.

Example 2 shows the essential handlers from the Main stack. (The Help stack has the same handlers, except that the local menu handlers refer to a menu called Helper instead of Main.) The only difference between the `openStack` and `resumeStack` handlers is that the `openStack` handler contains a message



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to a stack-specific startup handler. The local startup handler may lead the user through a title sequence, perform some calculation based on time or date, or do any of thousands of stack-opening tasks, depending on your stack's design. Because a resumed stack is already in the middle of things, the local startup sequence isn't necessary in the **resumeStack** handler.

Opening and resuming the stack, however, requires that a handler checks to make sure that the supporting parts of the stack system — the message hierarchy and the global menus — are in place. If you've clicked on this stack window from a nonsystem stack, all the shared materials need to be set properly. That's what the **checkSetup** handler does. It puts Preferences into the message hierarchy and then lets the shared stack's handlers do their magic. Once the global menus are in place, the handlers create the local menu on the far right of the menu bar. When it closes or is suspended, the stack removes the local menu. The **cleanUp** handler in the Preferences stack then

"unsets" the rest of the global items.

If you program a button to navigate directly to another stack (for example, from Main to Help), you can speedily bypass this **cleanUp** work by setting the **sameSystem** global to **true**, as shown in the **mouseUp** handler of the button leading to the Help stack in Example 3. As HyperCard shifts to the other stack, the **resumeStack** handler removes the local menu and calls the **cleanUp** handler. If the **sameSystem** global is true, the **cleanUp** handler won't reset the menu bar or respond to commands to do other time-consuming functions. The global is reset to false (in the **cleanUp** handler) after the operation, in anticipation of future navigation from this system to nonsystem stacks.

A Loophole

Although this template has proven workable in most situations, the methodology is not perfect. If, on your way from someone else's stack to yours, a script error gets in the way, your stack won't

receive its **resumeStack** or **openStack** message, so your menus and message hierarchy won't be in effect — a flaw I believe Claris should correct. You can get around this by invoking the **checkSetup** handler *before* issuing shared commands or by navigating to any other stack in your system.

You can get a copy of this template from Zmac — look for the filename HCTIP.SIT in the MacUser Forum's Library 3 (Utilities) — or by sending a check (\$5 in North America, \$10 outside North America) to Concentrix Technology, Inc., 1875 S. Grant Street, Suite 760, San Mateo, CA 94402. Whether you use these ideas or develop your own version, be sure to spread the word to your fellow stack authors. Let's be nice to each other and create stacks that are good citizens in the HyperCard community. ☺

Danny Goodman is the author of *The Complete HyperCard 2.0 Handbook* (New York: Bantam, 1990) and cofounder of Concentrix Technology, a publisher of modular, customer-modifiable software.



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**Compiled by
Gregory Wasson**

QuickKeys 2

QuickKeys 2 lets you create program-specific macros that are stored according to the name of the individual application. After you upgrade a program to a newer version, you may discover that all your QuickKeys macros for that program have disappeared. You can retrieve them by opening the QuickKeys resource and changing the program names and/or version numbers to the new ones. Here's how:

Open the Preferences folder in your System Folder. Inside the QuickKeys folder is a QuickKeys Preferences folder, which contains a KeySets folder where all your macro sets are arranged by program name. Simply change the version number on the filename, and you're set.

George E. Thompson
Chicago, IL

Excel

When opening an Excel file, it can be annoying to get an alert dialog box that tells you to update references to unopened documents. This is especially annoying when hidden macro sheets are associated with the "workspace."

Here's how to avoid this unwanted prompt. Files are opened in alphabetical order as specified in the saved workspace. To make your macro sheets open before the worksheets that reference them (thus avoiding the prompt), simply add a zero at the beginning of each macro-sheet name. This technique also works for combinations of worksheets and charts that are opened by a single document.

David M. Persweig
Stone Ridge, NY

FileMaker Pro

Sometimes when I use FileMaker Pro's Export menu, I can't export data from certain fields. In the dialog box that lets you choose

which fields to export, the program doesn't display all the available fields, and those that don't appear can't be exported.

The workaround for this is simple: Hold down the Option key while clicking on the New button in the Export dialog box. The Choose Fields dialog box, which appears next, displays all the fields. Simply select the fields you want to export.

When I called Claris' tech support to ask about this bug, I was told that this problem is most likely to happen in data files that have been converted from FileMaker II to FileMaker Pro. However, I have also experienced this problem with files that were created in FileMaker Pro.

Peter Baum
Cupertino, CA

ResEdit

Because I don't like to leave my external hard drive on my SE running all night but I often forget to turn it off, I started thinking about how to remind myself (and my kids) to turn off not just the Mac but also the hard drive. I decided to change the message in the Shut Down screen (the one that says, "You may now switch off your Macintosh safely."). Here's how to do it, using ResEdit on a copy of your System file:

1. Make a copy of the System file, using the File menu's Duplicate command.
2. Launch ResEdit, open the duplicate copy of the System file, and locate the DSAT resource.
3. Double-click on this resource, and then double-click on the ID 2 file.
4. Scroll down until you see the "You may now..." message in the narrow right column.
5. Starting with the letter Y, highlight the message through the last character, a period.
6. Carefully type in your message, using

Tip of the Month

Word 4.0

If you use System 7 and Microsoft Word 4.0 or a later version, you've probably already discovered that you can't use the Word Finder thesaurus DA that comes bundled with Word. Because of the way System 7 handles DAs, Word Finder gets confused when it looks to see if Word is running.

There is a workaround for this problem, however. (Note that this procedure should be performed only on a copy of the Word application — never experiment with the original program!)

First, open the Font/DA Mover utility. (You need version 4.1 if you're running System 7. If you have only an earlier version, boot from a

System 6 floppy disk and follow the rest of the directions.)

Open the Word Finder DA suitcase file on the left side of the Font/DA Mover dialog box. Hold down the Option key while clicking on the other Open button, and open Microsoft Word on the right side of the dialog box. Select Word Finder, and copy it into the Word application. Now quit Font/DA Mover.

Now, whenever Word is the active application, the Word Finder DA will appear on the Apple menu and function properly. Your writing will remain clear and creative, not to mention lucid and artistic.

Rick Sonntag
Media, PA

exactly 45 characters, *including* spaces. Save your changes.

7. Quit ResEdit, shut the Mac down, and restart from a floppy disk.

8. Save a copy of your original System file on a floppy disk. Replace the hard disk's System file with the duplicate copy, and change the copy's name to System.

9. Restart your Mac from the hard drive, and choose Shut Down from the Special menu.

10. Your message should appear the way you typed it. If you did something wrong, the Shut Down screen will flash, but that shouldn't cause any major problems. Simply retrace these steps, and make sure that you typed exactly 45 characters.

Dave Jagger
East Grand Rapids, MI

PageMaker

Don't erase your old PageMaker master disks when you get a new version, because the program recognizes only documents created with the current or previous version of PageMaker. In other words, PageMaker 4.0 can open and use documents created with version 3.0 or version 4.0, but it can't open documents created with PageMaker 2.0 or earlier.

You can upgrade all of your PageMaker documents each time a new version is released (and hope that you don't overlook a critical document!), but the safest solution is to keep all the master disks so that you can reinstall older PageMaker versions when necessary.

Robert Leahy
Tustin, CA

If you use a lot of fractions in your PageMaker documents, it's a good idea to define a macro that transforms a typed fraction such as 1/8 into a more professional-looking typeset fraction. To do this, you need a macro utility such as MacroMaker or CE Software's QuickKeys. (These instructions work for fractions that have one-digit denominators and numerators, such as 1/4 and 1/8.)

Type the fraction normally, place the cursor in front of the numerator, and open the macro program. Record the following steps:

1. To highlight the numerator, hold the Shift key and press the right-arrow key once.

2. Press Command-Shift-+ to invoke the superscript text attribute. Press the right-arrow key so the numerator is no longer highlighted.

3. To highlight the slash between the numbers, hold the Shift key and press the left-arrow key once.

4. Press Option-Shift-1 to replace the highlighted slash with the printer's slash character (/). This character works better with fractions than does the normal slash.

5. Highlight the denominator by holding the Shift key and pressing the right-arrow key once. Press Command-Shift-hyphen to invoke the subscript text attribute.

6. Press Command-T to access PageMaker's Type Specifications dialog box, and click on the Options button.

7. Tab three times to the Subscript position box, and type 0. Press Return twice.

8. Press the right-arrow key once to move the cursor off the denominator.

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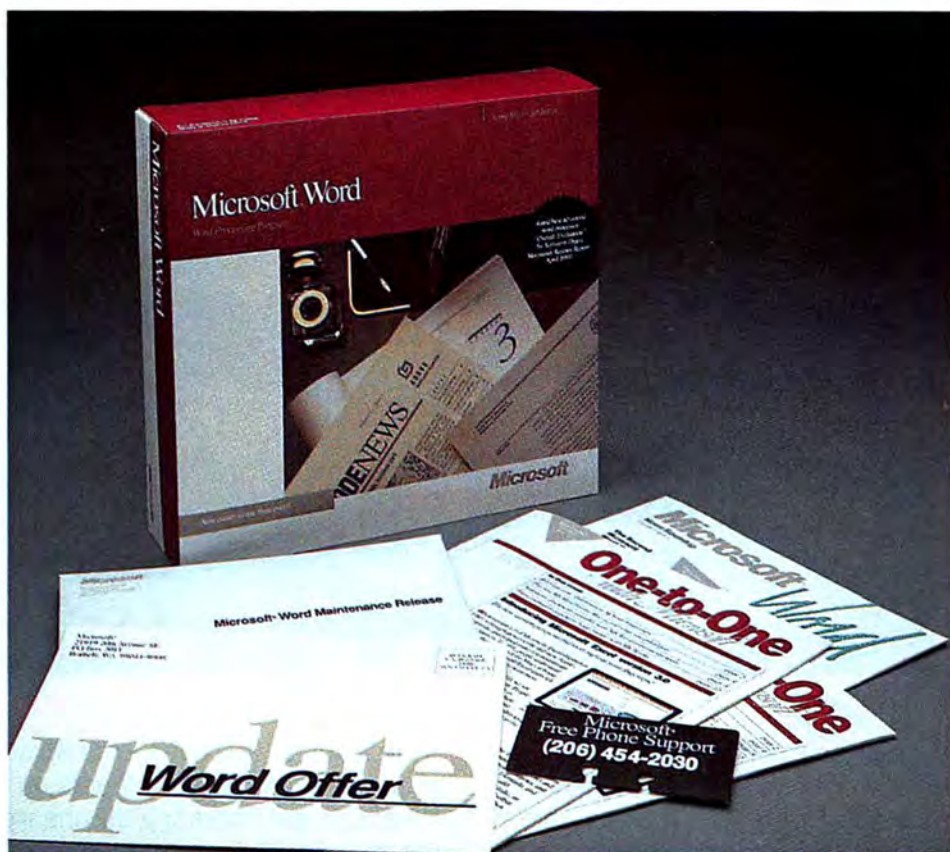
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9. Press Command-Shift-hyphen. This combination deactivates the subscript attribute so the subsequent characters after the fraction are not subscripted.

10. Stop recording, and save the macro.

If you use fractions with double-digit numerators and/or denominators, simply create another macro and press the right-arrow key twice in steps 1 and 5 to highlight the entire number.

The macro is cumbersome to define, but it saves you time whenever you use it. Another advantage is that because the superscript/subscript text attributes are defined as a percentage of the current point size, the fractions will always be the correct size.

Joseph W. Duhamel
Floral Park, NY

Tips from the Experts

4th Dimension

ACIUS' tech-support engineers recently shared with us some of their best tips for the relational-database manager 4th Dimension.

Getting from Runtime to User Mode. To immediately go from the Runtime opening screen to User mode, hold down the Option key and press F. This works even when no Quit menu item is installed.

Getting to the Debugger Window. Normally, to get into 4th Dimension's Debugger window, you have to put the Trace command into a script or procedure, where it can be evaluated. Here's a shortcut: Hold down the Option key, and hold down the mouse button while a procedure or script is running. Using this method, you don't have to put the Trace command into any code.

Outlining an Object or Group. When you're using the Layout Editor, it's possible to create an outline around any object or group of objects. Select the object, and then hold down the Command key and press any number from 1 through 9. Command-1 places the border one pixel out from the object; Command-9 places the border nine pixels out from the object (see Figure A).

Using the Arrow Keys to Move Objects. It's possible to move objects in a layout (when you're using the Layout Editor) by pressing the arrow keys. If you hold down the Command key while pressing the arrow keys, the upper left corner of the object will be anchored to the layout and the object will be resized according to the direction of the arrow key you're using. Holding down the Option key, instead of the Command key, and then using the arrows causes the object to move along the x or y axis defined on the grid (the default is ten pixels).

Bringing Up the Coordinates Box. Holding down the Control key and then double-clicking on an object while using the Layout Editor displays that object's Coordinates dialog box.

Seeing Scripts. A quick way to view scripts is to Option-click on an object that has a script. This immediately opens the script.

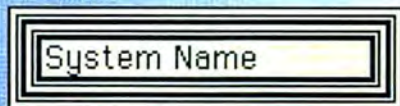


Figure A

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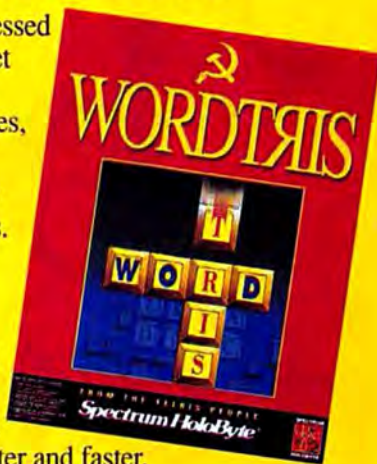
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M. Sprong
Forney, TX

Some People Never Learn

In your December '90 review of Fastback II you said it's a good idea to backup all the



Questions, anyone? Here's where to get answers from the experts. Bob LeVitus is the author of the best-selling Dr. Macintosh. Andy Ihnatko isn't. But he knows a lot about the Mac, and he's got a heck of an attitude. Together, they're ready to answer your questions about everything Macintosh.

✉ Write to Help Folder, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404.

Don't want to wait for an answer? Post your question on Zmac, MacUser's on-line service, and get a reply from Bob, Andy, or one of the other MacUser experts. See the masthead in this issue for instructions on how to sign up.

**By Bob LeVitus and
Andy Ihnatko**

Ants in My Mac

Q. My Mac SE and I live in an ant-infested college dormitory. This is great for my friends, who can make comments about "bugs in my system," but I'm worried. Is there any way I can seal my beloved Mac and keep it from becoming an expensive ant condo? I already have a set of nylon covers, but I don't think they're up to this job.

J. Wes Jarvis
Ashland, OR

Andy: Comment 1: Your pals are a hoot and a half. Comment 2: You may have the beginnings of a successful startup company sitting there on your desk, Wes. Having a computer serve as an ant farm sounds at least three times as cool as this "interactive multimedia" thing Apple's been trying to cram down our throats.

Now about your problem. I called a couple of exterminators, and the consensus is that there are only a few kinds of insects famous for wreaking havoc with electronics: cockroaches (wouldn't you know it), which nibble on the wiring's insulation; silverfish, which get zapped by the CRT yoke and cause short circuits; and fire ants, which tend to set up housekeeping in the Mac and leave eggs and other residue. So if you're in a *really* buggy environment, you may want to take some precautions.

After a lot of research (not to mention embarrassment) I've found the solution to your little problem. It's panty hose. No kidding. As Macintosh mosquito netting, it works like a charm. Go down to the drugstore; pick up a pair of black, queen-size, sheer-to-waist hose (you may want to shoplift them); and cut off a leg. After you've set up your Mac, stretch the

foot over the top and pull the rest of the leg down to the bottom, as if you were preparing your SE to participate in a bank heist. Secure the open end of the leg to the underside of the Mac with duct tape, bunching it around the various cords leading into your Mac, and you've got one bug-proof SE.

One of the beauties of the panty-hose solution is that it keeps the bugs out without restricting air flow through the Mac's cooling slots. And there's a bonus feature — the sheer black hose over the screen totally eliminates glare! Unfortunately, your floppy drive will be completely inaccessible, and on Parent's Weekend, you may have to explain what you're doing with a one-legged pair of panty hose in your closet.

For you other Mac users, I hope you appreciate what we do here at Help Folder in order to get at the Truth for you. I have tested as many kinds of Macs as I could and have compiled the following compatibility data for the Hose treatment:

- One leg works with the Mac Plus, SE, Classic, IIfx, Ilii, IIsi, and LC; most third-party hard drives; and Apple's 12-inch color and black-and-white monitors.

- One leg plus torso works with Apple's 13-inch color monitor and Portrait Display.

- Panty hose are incompatible with the Mac II, IIfx, and IIfx.

Crippled HyperCard

Q. My new Mac came with a copy of HyperCard that appears to be partially disabled. For example, the paint, button, and field tools are nowhere to be found. Is my version

*** ... But Were Afraid to Ask**

Obviously, *MacUser* sends most of its subscription forms to Brainiac-5 types who only need to know about 68040 biredundancy codes, but take heart. We at Help Folder also appreciate those simple questions that allow us to write simple, patient responses and then go to bed early. If your question is so simple or odd that you're ashamed to even ask, we'll say it was sent in by a whimsical character from the Beatles' *White Album*.

Q. I recently bought a portable 3.5-inch hard drive. One of this drive's many features is rubber feet on both the bottom and sides of the case. This made me wonder if it's better to have a hard drive lying down flat or up on its side. Is it possible for a drive to be "upside down," or are they directionally ignorant?

Sexy Sadie
Disc 2, track 5

Andy: Orientation really makes no difference. Like all inanimate objects, hard drives are mere puppets in our hands, but there's a catch: The

drive must be formatted in the chosen orientation. So, if your hard drive's been flat under your Mac for the past three years and you impetuously decide you want to stand it up on its side, you'll have to reformat the drive in that position or risk experiencing a ton of read/write errors.

In fact, you should treat your new drive the way you would a new tropical fish: Spend some time allowing the newcomer to get used to its environment. A drive that's spent the past two weeks in hot, humid trucks won't react well to sudden immersion in an air-conditioned office. Before installing new equipment, let it stand in its new environment for a few hours.

Actually, though, there *is* such a concept as "upside down"; all the drive manufacturers I talked to stress that if the drive is to be mounted horizontally, the shiny platter enclosure should be on the top. As to preferred vertical orientation, well, a few people ventured the opinion that the top of the drive (the metal part) should be on the right.

different from that sold by Claris?

Rosa Winston
Brooklyn, NY

Bob: The version you got with your Mac is the same as the one Claris sells, but its Home stack is locked at the second level (Typing). To access the higher user levels — Painting (level 3), Authoring (level 4), and Scripting (level 5) — here's what to do:

1. Launch HyperCard, and go to the last card (Command-4).

2. Make the Message box visible (Command-M).

3. Type **Set the UserLevel to 5**; press Return.

4. Type **Magic**; then press Return.

Your copy should now have all five user levels available.

If you're a real HyperCard fanatic, you might consider buying a copy from Claris. Although the application and Home stack are exactly the same, the Claris versions (the \$49 upgrade kit and the \$199 development kit) include comprehensive documentation, lots of additional stacks — including the excellent HyperCard Help and HyperTalk Reference stacks — and free (but not toll-free) technical support.

PageMaker 4.0 Unexpectedly Quits

Q. We're having a mysterious problem with PageMaker 4.0 that no one, not even Aldus' technical support, has been able to solve. When I use the Print command, the application "unexpectedly quits" (if in MultiFinder) or I get a system-error message (if in the Finder) and have to restart. This happens instantly — the Print dialog box doesn't even start to show up. It also happens with both old and new PageMaker documents.

What makes it really puzzling is that we have another Mac in the office that is the

same model, was bought the same day, and has the same software configurations on it, and we can print from PageMaker on this Mac without any problems.

I've reinstalled the System, the Finder, MultiFinder, the PageMaker application, and the printer driver. I've tried starting up with the System on a floppy. I've increased the System heap with HeapFixer. I've checked for viruses with SAM. The Aldus person talked me through my System Folder, but I have few INITs and no likely culprits. Help!

Kurt Bodden
Cambridge, MA

Bob: It sounds as though you've already done many of the right things, but there are still a couple more to try.

I had a similar problem with PageMaker several months ago. Every time I tried to use the spelling checker, it quit unexpectedly or crashed. Aldus tech support was stumped, and so was I. Reinstalling PageMaker didn't help, nor did anything else we could think of. Finally, out of frustration, I decided to trash my PM4 Defaults file (in the System Folder) and let PageMaker automatically create a fresh one for me, which it did the next time it was launched. That was all it took. Try it — it may work for you too.

Another thing: You say you reinstalled the System, the Finder, and MultiFinder. But did you trash your old System, Finder, and MultiFinder *before* running the Installer? It's always safest to do just that. The correct procedure for re-installing your System software when you suspect it has become damaged or corrupted is as follows:

System 6 users: If you've installed any fonts or DAs into your System file, use Font/DA Mover to make copies of them and stash the copies somewhere on your hard disk so you can reinstall them after installing



Figure 1: System 7 lets you easily customize your folder icons. In this case, delete the default folder icon in the folder's Get Info box and paste in a piece of clip art.

the new System software. (This step is unnecessary if you use Suitcase II or MasterJuggler to access fonts and DAs.)

System 7 users: If you've installed any fonts or sounds into your System file, double-click on the System file and drag those fonts or sounds into another folder and then stash that folder somewhere on your hard disk so you can reinstall its contents after installing the new System software.

Next, restart your Mac with a floppy disk containing a System file and delete the System, Finder, MultiFinder, and printer-driver files from the System Folder on your hard disk. If you don't delete these files before running the Installer, it may just *update* the System, MultiFinder, and printer driver files instead of *replacing* them. If these files were corrupted before you ran the Installer, updating may not correct the problem but replacing them will. Now run the Installer.

That's all there is to it. You now have fresh System software on your hard disk. If that's

what your problem was, all should be right.

Editing Icons on Folders

Q. Is there a way to change system icons such as folder icons individually? For example, can my word-processing folder have one icon and my utilities folder a different one?

John Yoder
Alexandria, VA

Bob: You're in luck, John. It's not only doable but it's actually easy if you're using System 7, which lets you edit or colorize icons with nothing more complicated than a paint program. Here's how:

1. Select an icon, and choose Get Info from the File menu (Command-I).

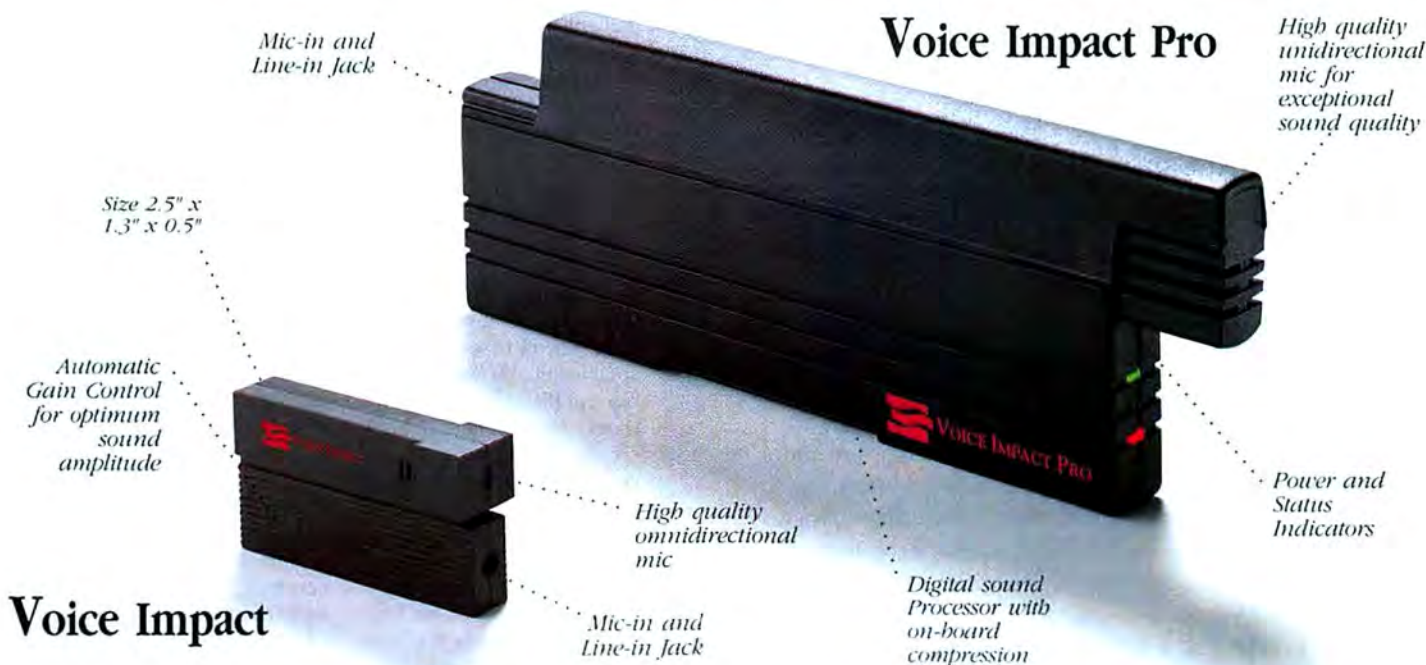
2. In the Get Info window, click on the icon once to select it, and copy it.

3. Open a new document in a paint program, and paste the icon into the document.

4. Modify the icon in any way you want, and then select it, and copy it.

5. Return to the icon's Get

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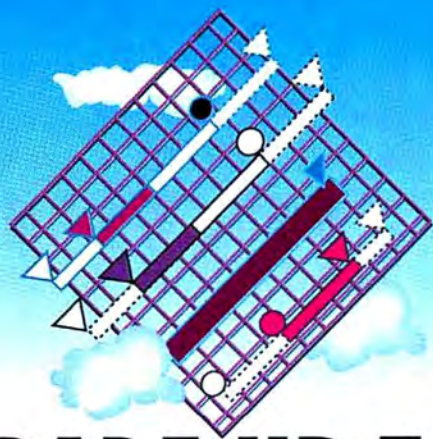
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• Auto Gain Control	✓	✓	✓	✓
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• Supports sound editing within 3rd party applications	✓	✓	✓	✓
• Advanced sound editing application	✓	✓	✓	✓
• Clip to attach to Mac	✓	✓	✓	✓
• HyperCard Tool Stack	✓	✓	✓	✓
• On Line Help	✓	✓	✓	✓
• Works with MacRecorder compatible software	✓	✓	✓	✓
• Libraries for writing custom software	✓	✓	✓	✓

^{**}Product specifications and comparisons based on published company information as of July 10, 1991

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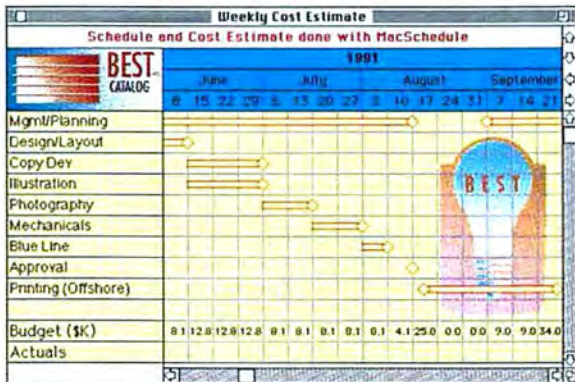


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POWER TOOLS HELP FOLDER

Info window, and paste in the new icon. Presto — that file, folder, or disk now sports your redesigned icon (see Figure 1).

By the way, System 6 does not let you edit the icon of a single folder, no matter how proficient you are with ResEdit. You can use it to edit folder icons (they're stored in the Finder's ICN# resource), but the editing affects every single folder.

Fade to Black

Q. I'm using a Mac Plus and have recently been experiencing problems with the screen blanking out. Sometimes when I'm working in an application, the screen goes black or flickers between what should be there and a black screen. This occasionally occurs just after I've turned on the computer.

The only way to get the screen back to normal is to tap the side of the Mac (actually, any jolt that shakes the computer works). I know this is not the way to solve this problem and could cause more damage in the long run. Could you give me advice on what the problem might be and the best (and cheapest) way to have it fixed?

Greg Brunn
Treasure Island, CA

Bob: Well, Greg, there's bad news and there's bad news. The bad news is that whatever is making your Plus act up will require the intervention of an Apple repair technician. And the bad news is that it sounds like your power supply is about to breathe its last — my old Plus behaved a lot like that just before its power supply gave up the ghost.

If it's not the power supply, a connection — video or other — may have worked itself loose. In any event, you need to have your Mac examined by a qualified technician.

Andy: Ouch. Normally I'd chirp in here and say, "Technician, schmectician! Fix it yourself!" But when you're

talking about a Plus power supply, you're talking delicate, dicey surgery. A loose connection can easily be resoldered, but the fact that the juice pent up in the CRT is enough to kill you (and 11 of your closest friends) hours after the Mac has been unplugged is enough to make anyone twitch. As a Plus owner, you have to accept the fact that you may have to buy a new power supply at some point. But cheer up — at \$300, it's still cheaper than buying a new IIfx, or even a Classic, for that matter.

Voice Transcription on the Mac

Q. I'm looking for a voice system to transcribe technical information from a cassette tape to a printer via my Mac Plus. Is there such an animal?

F. Ambrosio Malagon
Oceanside, CA

Bob: After doing a bit of detective work, I discovered that Articulate Systems, which makes Voice Navigator II, is hard at work developing voice-transcription technology. However, it probably won't be available for at least a year and will almost certainly require a more powerful computer than your Mac Plus.

Andy: The general consensus in the proud community of Professional Computer-Science Dweebs (of which I hope to be a member one day) is that we're about three years away from a for-real voice-input system with which yoo-doe-ent-hav-eh-too-tawk-strayn-jeh. Several companies have working prototypes, but we're still far from a reliable plug-and-play speech-recognition system.

And even when such a system reaches the market, it'll probably be designed for simple business words and would probably burst into flames if you gave it technical words such as *pentadexion*, *acetomine*, *triamino*, or even *polypeptide*.

IIsi versus MacPaint and Excel

Q. I recently purchased a Mac IIsi running System 6.0.7, and I'm having problems with my software. First, MacPaint and some other graphics programs have a strange checkerboard pattern over the menu bar. Second, I can't launch Microsoft Excel. It keeps telling me that the floating-point coprocessor is not installed, even though it works fine on an SE or a Classic, both of which also have no FPU math coprocessor. I have removed all my INITs and control panels, but still no go. What must I do?

Joe Ortega

Frankfurt, Germany

Andy: That checkerboard pattern usually means that you're using a graphics program that was written sometime in 1958, well before the advent of color Macs. Because the color screen is "deeper" (has more bits of data per pixel) than the original noncolor Macintoshes, the program gets confused about where in memory the bit maps should go and you end up with that Warhol-like effect. The software will probably work just fine if you go to the Monitors control panel and set your screen to Black & White. New versions of MacPaint (released after 1986) should work fine in color mode.

There's no quick fix for the Excel problem, unfortunately. It sounds as if you have a truly ancient copy that just ain't on speaking terms with the Mac IIsi.

I suggest that you upgrade your software. I'm sure you didn't buy a spiffy new Mac just so you could run software written for a machine with only half the IIsi's features!

Plus Versus Classic and SE

Q. I have a Macintosh Plus, and I used to wonder if I ought to spend the extra money to

upgrade to an SE, because the SE has a faster SCSI bus and a 256K ROM chip, compared with the 128K of the Plus. I didn't upgrade, because I never saw anything the SE could do or any software it could run that the Plus couldn't. But now that the Classic (with its 256K ROM) has arrived and the Plus and SE are no longer available new, will all Mac software need at least 256K of ROM to work? Also, does System 7 require 256K of ROM? Just what does that extra 128K of ROM do anyway? And finally, should I dump my Plus in favor of a Classic?

Joel Williamson

via CompuServe

Bob: Neither the Classic nor the SE is a whole lot more capable than your Plus, although both are faster and all Classics and most SEs have 1.4-megabyte SuperDrives. System 7 runs on all Macs from the Mac Plus up, so you should be fine, as long as you have enough RAM and a hard drive (System 7 doesn't require a 256K ROM, but it does require at least 2 megabytes of RAM and a hard drive).

Andy: We did a more intense breakdown of the struggle between the Plus and Classic in last April's Help Folder (see "Plus Obsolete?", page 250). I wouldn't worry too much about Macintosh Plus incompatibilities. Problems occur not because there isn't enough ROM but because the program you're running is trying to use a feature the ROM does not support—Color QuickDraw, for example.

Although the Classic has four times the ROM capacity of the Plus, that extra space is almost completely filled up with code that lets the Classic work as a "diskless" AppleShare server. So again, don't sweat it. Although I wouldn't recommend buying a used Plus over a new Classic, I think that "upgrading" from a Plus to a Classic is rather pointless. ☐

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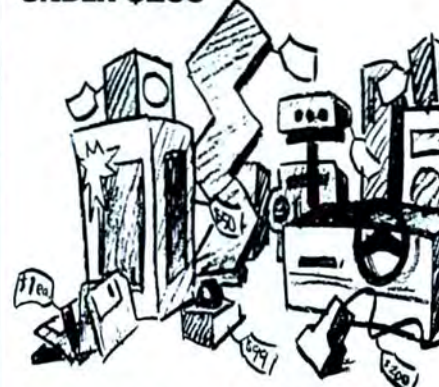
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- Incredibly fast! MacWorlds Fastest 1.2Gig!



JX-9500PS Sharp Printer 35 Fonts

JX-9500PS 35 Fonts..... \$1648.00

- 2.5 mb Ram Memory
- MacUser #1 printer 4.5 mice rating
- 35 Fonts, 6 page per minute
- Letter, legal and transparencies
- Includes Appletalk interface!
- Sharp is the manufacturer of the TI Microlaser, this is the same printer!

800 K Floppy Drive \$99

These Fujitsu External floppy drives have a one year warranty.

Completely compatible.

These are brand new slimline drives and they look great!

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Q 120 MB 3.5"	\$598	\$658
Q 170 MB 3.5"	\$688	\$758
Q 210 MB 3.5"	\$778	\$848
Wren 337 MB RUNNER	\$1398	\$1498
Wren 600 MB F/H	\$1598	\$1698
Wren 630 MB RUNNER II	\$2998	\$2098
Wren 1.2 Gig	\$2298	\$2398

19" Color Monitors!

19" Ikegami Color System	8 Bit	\$1098
DM-2060	24Bit	\$2098
19" Trinitron Color System		\$2398
Ikegami CT-20	24Bit	\$3198
19" Sony Color System	8 Bit	\$2398
Sony GDM 1954	24Bit	\$3198

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Macintosh IIsi 5/120	\$3225.00
Macintosh IIsi 5/0	\$3499.00
Macintosh IIsi 5/105	\$3975.00
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Macintosh IIfx 8/210	\$5869.00
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Systems and More...

All of our packages are complete. There are not any hidden extras to buy.

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\$4999

Mac IIsi Designer Package
8 Mb of RAM, 170 Mb internal hard disk, Mouse, Apple extended keyboard, Radius Color Pivot with built-in video, and Apple Personal LaserWriter NT

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If you need it in print, the collection of printers we have to offer can't be beat in performance or price!

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Apple StyleWriter	\$439.00
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Epson EPL-7500 with RISC processor	\$1949.00
GCC BLP Elite	Call
TI MicroLaser PS17 w/AppleTalk	\$1299.00
TI MicroLaser PS35 w/AppleTalk	\$1680.00
NEC SilentWriter 2 Model 90	\$1649.00
QMS PS-410	\$1995.00

Internal Drives and More...

Quantum and Connor drives are the best on the market. They are fast and reliable. All ETC internal drives come with brackets, cables and software.

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ETC 120 Mb Connor-1, 19 msec	\$455.00
ETC 120 Mb Quantum PRO, 11 msec	\$579.00
ETC 170 Mb Quantum PRO, 11 msec	\$640.00
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ETC 1.05 Gig WREN-7, 15msec	\$2299.00

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ETC 307 Mb WREN-4, 16.5 msec	\$1299.00
ETC 337 Mb WREN-Runner-1, 10.7 ms	\$1399.00
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We have a complete collection of Apple and Apple compatible video products. Call us with your video requirements, and we will help you choose a video system that is right for you and your system.

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Apple 12" RGB Monitor	\$429.00
Apple 13" RGB Monitor	\$669.00
Apple 15" Portrait Monitor	\$769.00
Apple Two Page Monitor	\$1199.00
Seiko 14" Trinitron RGB	\$619.00
Macintosh Display Card 4+8	\$439.00
Macintosh Display Card 8+24	\$545.00
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512K VRAM Upgrade for Mac LC	\$99.00

High-end Video and More...

If you need to see more than 640x480, here are some of the most innovative video solutions around.

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RasterOps 8L Display Board	\$1279.00
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for SE 30, LC II, IIsi	

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Microtek 6002S Color Scanner	\$1499.00
Includes Adobe Photoshop	

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LEAN, MEAN, POSTSCRIPT MACHINE.



THE NEW \$1599 BLP ELITE.

Finally, the first affordable PostScript® printer designed specifically for Macintosh® users. It's from GCC Technologies®, and it's called the BLP Elite™. A printer so advanced that it offers exactly the features you're looking for, at a price you've never seen before. Just \$1599.

That's a full \$1000 less than Apple's \$2599 Personal LaserWriter® NT. But that doesn't mean the BLP Elite has less to offer. In fact, the BLP Elite is packed with more features you want, like true Adobe® PostScript and built-in AppleTalk® for sharing over a network. There's also edge-to-edge printing for super-sized spreadsheets and banners, and a straight-through paper path for printing wrinkle-free envelopes and labels.

The new BLP Elite is a faster printer, too.

In fact, with its 16.67 MHz processor, it's one of the fastest 4 ppm (page-per-minute) PostScript printers you can buy. About 40% faster than Apple's Personal LaserWriter NT.

But what makes the BLP Elite a more sophisticated, more affordable printing machine is its breakthrough technology, engineered at GCC.

At the heart of the BLP Elite is the most compact, cost-effective PostScript controller board ever designed – half the size of the Apple Personal NT's, with one-third the number of chips.

A compact controller means two things: fewer components and lower manufacturing costs, which translates to exceptional product reliability and a significant cost savings for you.

800-422-7777 for the BLP Elite.

The new BLP Elite PostScript printer is available from your Authorized GCC Dealer or directly from GCC. Call 800-422-7777 for the name of the dealer nearest you or to place your order directly with us. Either way, you'll find it's painless to go lean and mean with the new BLP Elite.



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Storage



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IDS PRO is a series of portable hard drives designed for high-capacity storage. The Pro is heavy-duty shock mounted in a rugged, scratch-resistant shell. Units weigh less than 3 pounds and come in 20MB to 200MB.



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Abaton

LASERSCRIPT LX.....\$1599

Abaton's new LaserScript LX printer is a steal. Featuring 6 pages per minute, and all active I/O ports for both Apple Talk and PC Interfaces. Automatically switches emulation between PLC 4 and PostScript compatible languages. The LaserScript LX rarely requires user intervention and comes with a 1 year warranty and 90 day on-site maintenance service.

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MICROTEK

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Business



MICRON

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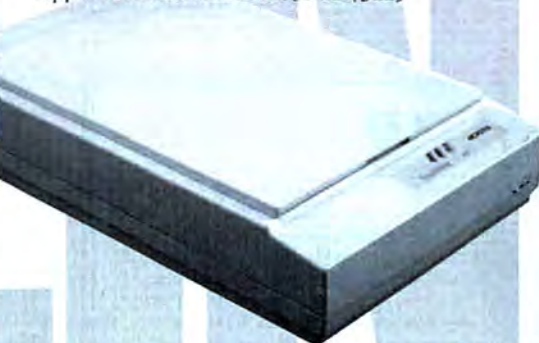
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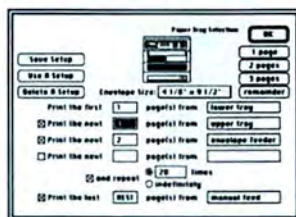
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\$3995!

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What's so great about PostScript® Level 2?

It's very, very fast (see chart on opposite page). Raw type characters are built 4 to 5 times faster, and text quality at small point sizes is greatly improved.

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- RISC processor*
- 8 ppm (11x17)
- 16 ppm (letter)
- Choice of 300 or 400 dpi

4 Mb RAM, upgradable to 16 Mb!

Includes a SCSI port for a hard disk. The RT Laser 400 includes 35 resident PostScript® typefaces. Compact design (measures 20.25"W x 16"D x 11.75"H; weighs 80.5 lbs).

Comes with two trays and manual feed as standard features (optional bypass feeder available). PLUS, you can specify 300 or 400 dpi printing! Call for other technical specifications.

* The RealTech Laser 400 and RealTech Laser use a RISC-based controller (Reduced Instruction Set Computing). RISC is the new generation of processors for speed and performance.

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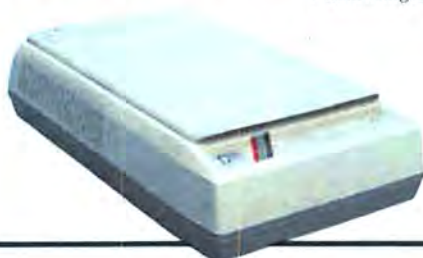
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\$1439!**



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Mac II, IIcx, IIci, IIx, IIfx	GS 256	\$1479
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- Flat CRT, P4 phosphorus, polished screen
- One-year warranty

CPU	Monitor	Price
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Mac II, IIcx, IIci, IIx, IIfx	GS 256	\$1079
Mac IIsi, IIci	GS 16	\$495
Mac Portable	Mono	\$849



Several members of our management team
(left to right): Barbara, Jim, Lew, Réal.

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SYSTEMS

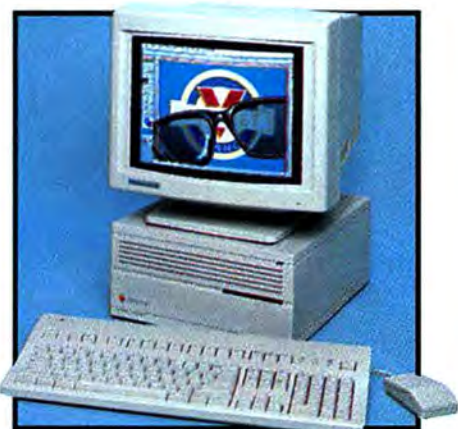
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Ili-1350	15.0	1.4	3519
Ili-644NP	11.9	3.0	2729
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Ili-1350NP	15.0	3.2	3869

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SB606NPR	7.0	3.6	4649
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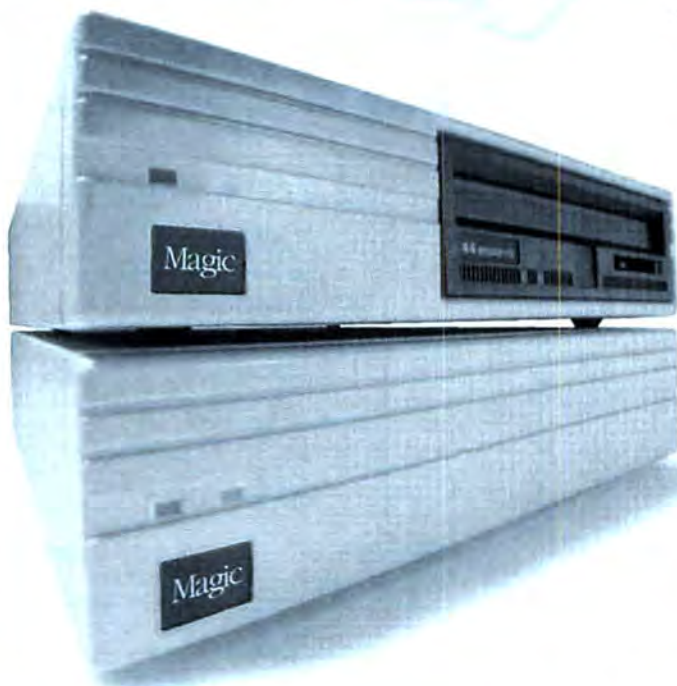
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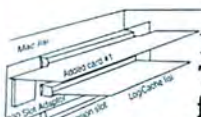
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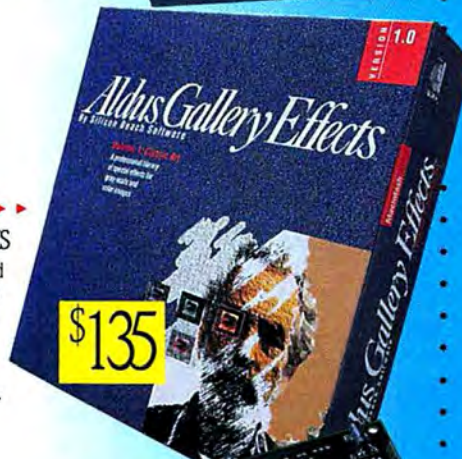


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7 or my name isn't Mac. —Mac

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MacTel Technology Corporation is a global corporation specializing in the design, manufacturing and distribution of a wide array of Macintosh peripherals. Our state-of-the-art surface-mount manufacturing facilities are located in Austin, Texas, which also hosts the hard drive assembly line, research laboratories and testing center. Our sales offices in Switzerland, France, Germany and the U.S. enable us to provide prompt, courteous, reliable service support to fill your Macintosh needs worldwide.



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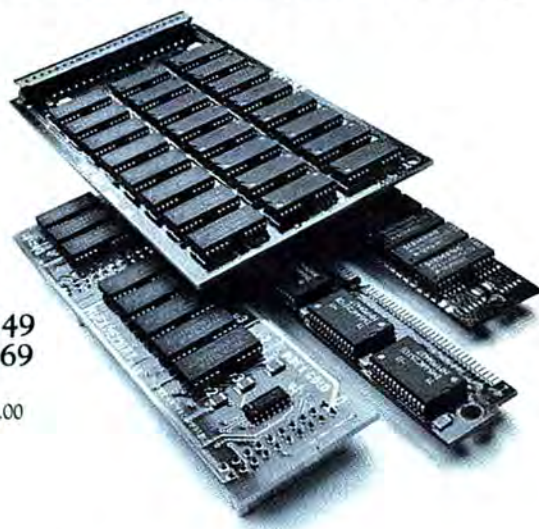
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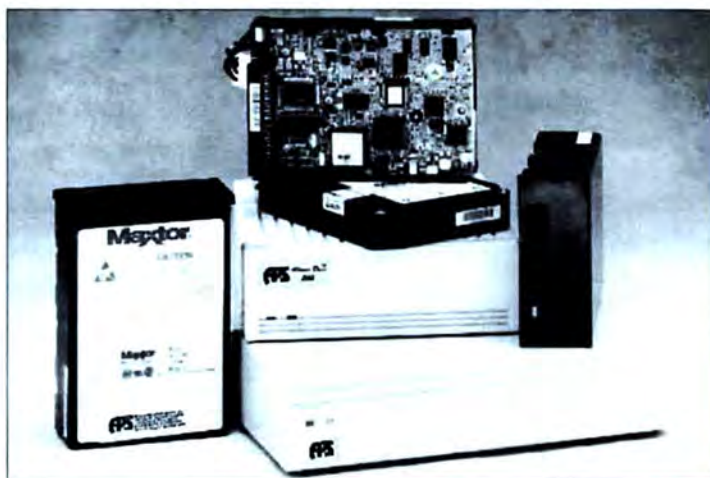
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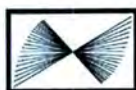
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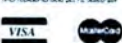
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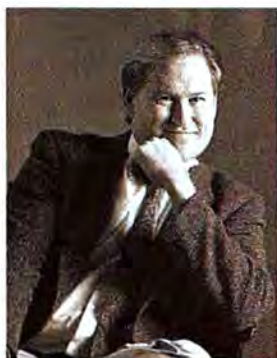
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Swami Dearest



What could scare Apple and IBM enough to make them start talking to each other? The Swami knows . . .



It was a bleak day outside Apple's headquarters. Pickets were complaining about layoffs. Rumors were running rampant that the slowdown would ruin Apple and that it would be years before the company could make a comeback. It looked bad. Meanwhile, there was talk about Apple doing a deal with IBM. What did it all mean?

I had no choice but to visit my old friend Swami Sri Swish Nanda in his new meditation dome just outside of Pensacola, Florida. The Swami had long since moved from his old San Francisco tree house, and I hadn't seen him for years. So I decided to take the *MacUser* Learjet to find the Swami and see if he could use his powers of virtual oneness to simulate the future.

At the airport, much to my amazement — although I shouldn't have been surprised — was a limo with two of the Swami's scantily clad veiled assistants waiting to escort me to his quarters. We rocketed out of the airport, and in minutes I entered an enormous dome, where I was put right into an elevator that took me down at least ten stories into the earth.

The doors opened to reveal the Swami in the middle of a luxuriant football-field-sized room replete with trees, a brook, deer, birds, a couch, and a large-screen projector TV. "Come on in, Dvorak. I'm tuning up the new projector crystal ball. If we wear these special cybergoggles — here, sit down and put them on — we can get some idea of what things will be like for Apple in 2009. That's the year of the last meeting of Apple as an entity."

He motioned me to the couch, and I donned the glasses. The Swami sat down next to me, and we both stared at the screen as it began to flicker. He poked me. "Oh, did I mention that Apple is a division of IBM in 2009?"

As I was about to express my shock, the screen and the glasses came to life and we were transported into the boardroom of IBM. I didn't know the CEO, but he looked like Michael Milken. It was a bizarre scene. The room was coal-black marble. Everything was black except for a series of bright halogen spotlights overhead, beaming down on the room's occupants and making them all look ominous. John Sculley was at one end of the table, strapped tight to a chair, with a gag in his mouth. Beside him stood two tall goons — guards. Next to him at the table was an aged Steve Jobs, who looked like he was 90 years old. Older than Sculley, for sure.

The CEO spoke. "Sculley, ol' boy, you

know the story. When we acquired IBM for our German brothers after the United Europe began to dominate world affairs, we expected the Apple division to be cooperative. It wasn't my idea to incorporate your company. It was the idea of John Aker, along with his pal Ross Perot. Apparently it was part of a grand scheme to save Perot's investment in that money-drain NeXT. Right, Steve?"

The old, saddened Jobs looked up nervously. He was real scared. "Right!" His eyes darted left and right. Then he hunched down in his chair, not wanting to look Sculley in the eyes. Sculley jerked about, trying to get free.

The CEO continued. "But that was before we knew that the United Europe would dominate. Its rules are what we play by. And it seems that Apple does not want to play by the rules. The plan is for you to be absorbed, eliminated! That's why you are being paid so much. The idea was simple. You started talking with us in 1991. We did joint ventures in 1992. You sold us stock in 1993. You feigned another round of problems in 1994. We took you over in 1995.


"Of course, things change. I came on board after the stockholder revolt; then our friends the Germans — er, I mean the Europeans — take us over; and we jointly develop one standard for one world. One standard, John, do you understand?"

He motioned to one of the guards, who removed the gag from Sculley's mouth. Sculley began to shout. "You creep! We had a deal. We had a deal!"

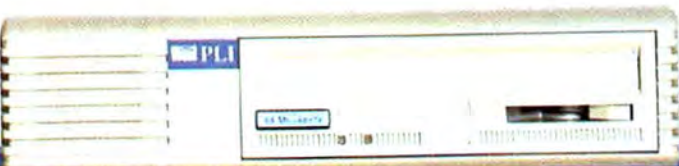
The CEO motioned to the other guard, who then slapped Sculley hard across the face. "Shaddup!"

Suddenly the screen went blank, and sparks flew from the cybergoggles. I threw mine off as a couple of large guys in turbans ran into the room and blasted the smoking goggles with CO₂ from fire extinguishers.

The Swami was laughing. "I tell you, Dvorak, ever since I heard about the IBM-Apple talks, I've been trying to find out what exactly this 'deal' was that they made, and each time this type of thing happens. There is something weird about all this. I have only one clue. Look at this video still of the CEO. We did a computer analysis of what he might look like today — 18 years younger."

He handed me a sealed envelope and told me not to look at it until I was flying home. Somewhere over Iowa, I tore open the envelope. It was a picture of Bill Gates! 

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